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SMITHSONIAN

MISCELLANEOUS COLLECTIONS.

VOL. VII.

"EVERY MAN IS A VALUABLE MEMBER OF SOCIETY WHO BY HIS OBSERVATIONS, RESEARCHES, AND EXPERIMENTS PROCURES KNOWLEDGE FOR MEN."—SMITHSON.

WASHINGTON:
PUBLISHED BY THE SMITHSONIAN INSTITUTION.
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SMITHSONIAN MISCELLANEOUS COLLECTIONS.
165

MONOGRAPH

OF THE

BATS OF NORTH AMERICA.

BY

H. ALLEN, M.D.

ASSIST. SURGEON, U. S. A.

WASHINGTON:
SMITHSONIAN INSTITUTION:
JUNE, 1864.

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ADVERTISEMENT.

THE following memoir, by Dr. Allen, is designed to exhibit the present state of our knowledge respecting the species of *Cheiroptera*, or bats, found in America, north of Mexico, and their general geographical distribution. It is based principally on the specimens in the Museum of the Smithsonian Institution, although the collections of the Philadelphia Academy of Natural Sciences and of the Museum of Comparative Zoology of Cambridge have also been consulted.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION,
WASHINGTON, April 26, 1864.

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INTRODUCTION.

AMONG the numerous agents which Nature employs for restricting the excessive increase of the insect world, the bats hold a conspicuous position. Eminently adapted to an animal regimen, the vast majority of these animals are exclusively insectivorous in their habits. Mosquitos, gnats, moths, and even the heavily mailed nocturnal *Coleoptera*, fall victims in large numbers to their voracious appetites. Certain members of the order, such as Flying Foxes (PTEROPODIDÆ), are strictly frugivorous, it is true; and others, as the Dog-bat of Surinam (*Noctula leporina*), classified as an insect-eating bat, partakes occasionally of fruit in addition to its more animal diet; none of the species found in this country, however, are known to subsist on any other than insect food. In this respect they hold a decided relationship to certain birds, and it is interesting to observe how, under different circumstances, these widely separated animals serve us to the same end. The functions which the latter perform during the day, the former assume in the evening. The latter prey upon the diurnal insects, while the former feed exclusively upon the crepuscular and nocturnal kinds. The disappearance of the birds of day is a signal for the advent of the dusky host, which, as it were, temporarily relieve from duty their more brilliant rivals in guarding the interests of Nature.

But, while thus connected with birds in their position in the world's economy, bats have none of that grace of form, or beauty of coloring so characteristic of the others. Their bodies are clumsy and repulsive; their hues are dull and unattractive—nor can the eye dwell with pleasure upon their grotesque and awk-

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ward motions. This aversion—so universally evinced toward these little animals—is heightened by the associations of the time and place of their daily appearance. Attendant, as they are, upon the quiet hours of twilight, when the thickening gloom is conducive to the development of superstitious feeling, bats have always been associated with ideas of the horrible and the unknown. In olden times, when the imagination of the people exceeded the accuracy of their observations, it was one of the numerous monsters inhabiting their caverns and forests. It has done service in many a legend; its bite was fatal; it was the emblem of haunted houses; its wings bore up the dragon slain by St. George.

It is easy to trace from this early impression the permanent position that the bat, as an emblem of the repulsive, held in letters and the arts. It is mentioned in the Book of Leviticus as one of the unclean things. Its image is rudely carved upon the tombs of the ancient Egyptians. The Greeks consecrated it to Proserpine. It is part of the infernal potion of the witches in Macbeth, while Ariel employs it in his erratic flights. In art, its wings have entered largely into the creation of those composite horrors—evil spirits, nor have modern artists escaped from the absurdity of encumbering the Satan of Holy Writ with like appendages.[1] Of this association with the monstrous the intelligent observer ceases to take note when the finer beauties of structure develop themselves under his gaze. Upon acquaintance he learns, perhaps with surprise, that, in anatomical and physiological peculiarities, and zoological position, the bat is a subject for study worthy of the attention of the most contemplative. Indeed, no order of animals is more interesting, and none has received greater attention from the hands of savans.

The early pioneers of natural history were far astray in their endeavors to correctly define the nature and position of the bat.

"Some authors place bats among the birds, because they are able to fly through the air; while others assign them a position

[1] To this fancy of the ancients of placing the wings of a bat upon demons is happily opposed the sweet conceit of poets in adorning the figures of angels and cherubim with the wings of birds. The wing of a bat is sombre and angular—that of a bird is of delicate hues and replete with curves. It is therefore poetic justice to have the one become an emblem of the infernal as the other is an expression of the heavenly form.

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among the quadrupeds, because they can walk on the earth. Some again, who admitted the mammalian nature of the creatures, scattered them at intervals through the scale of animated beings, heedless of any distinction excepting the single characteristic in which they took their stand, and by which they judged every animal. These are but a few of the diverse opinions which prevailed among the naturalists of former times, among which the most ingeniously quaint is that which places the bat and ostrich in the same order, because the bat has wings and the ostrich has not."[1]

Without reviewing the recorded errors of these observers, we will be content to call the attention of the reader to the following brief account of the structure of flying animals, so that the true position of the bat among them may be definitely fixed.

There are two distinct types of modification which the vertebrate skeleton has undergone in adapting the animal for flight, both of which depend upon some peculiarity in the structure of the anterior extremities; and in order to obtain a correct opinion of them we propose to cast a glance at each in turn.

Plan of bony structure of the wings of flying vertebrate animals.

a. Bones of carpus separated; flight maintained by dermal expanse	I. Wing membrane supported by all fingers— *Bats* (Vespertilio), order of MAM.
	II. Wing membrane supported by the 4th finger only (which is immensely developed), the others remaining free— *Pterodactyles*, order of REPT.
b. Bones of carpus united; flight maintained by dermal appendages	III. Bones of metacarpus 2–3 in number— Feathers not radiating— *Living birds* (AVES)—class.
	IV. Bones of metacarpus 4 in number— Feathers radiating— *Archæopteryx* (AVES)—subclass.

[1] Wood, Nat. Hist. I (Mam.), 114.

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I. The BAT, in which the humerus is long and slender, with a small pectoral ridge. Ulna rudimentary, attached to the curved radius, which constitutes the bulk of the forearm; carpus composed of 6 bones; the metacarpal bones 5 in number, separate and distinct; the phalanges generally 2 in number; thumb, and in some the index finger surmounted by a claw.

a. II. The PTERODACTYLE, in which the humerus is short and straight, very broad at head, with angular and prominent pectoral ridge; ulna and radius distinct, of nearly equal size; carpus composed of 5 bones; metacarpus of 4 bones, separate and distinct; 1st finger with 3 joints, 2d with 4, 3d with 5, 4th with 4 joints, all provided with claws, with the exception of the 4th, which is remarkable for the extraordinary development of its several joints. It is from this last mentioned finger to the base of the foot that the skin was stretched by which the animal was enabled to fly.

III. The BIRD, in which the humerus is curved, more or less slender; pectoral ridge prominent, not angular; ulna large, curved, not united with the slender and more diminutive radius; carpus of 2 bones; metacarpus of 2, sometimes of 3 bones—the first being small and cylindrical, the other two of larger dimensions and united so as to form a bone resembling the bones of the forearm; ulnar phalanx of 1 joint, united to the radial which is composed of 2.

The power of sustaining flight not dependent upon the expansion of skin, but upon the excessive development of dermal appendages (feathers).

b. IV. The ARCHÆOPTERYX[1] agrees with the typical bird in general particulars, but differs in the number of the metacarpal bones, which are here 4 in number: the 1st and 2d are slender, free and separate from one another; the 3d and 4th bear considerable resemblance to those of extant birds, in being large, stout, and closely approximated; but are not, however, united.

Flight is supposed to have been maintained in the same manner as in living birds.

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[1] *Archæopteryx lithographica*, H. VON MEYER, a fossil of the Lower Jurassic formation of Germany, obtained from the lithographic stone at Solenhofen. It was first made known to science by Prof. Wagner, at a meeting of the Mathematico-Physical Class of the Royal Academy of Sciences of Munich, in 1861, and was more minutely described, by H. Hermann von Meyer, in Jahrbuch für Mineralogie, 1861, 561.

This remarkable fossil, which is at present exciting such profound attention among anatomists, combines the characters of the bird and the reptile so intimately that it was for a time a matter of doubt to which

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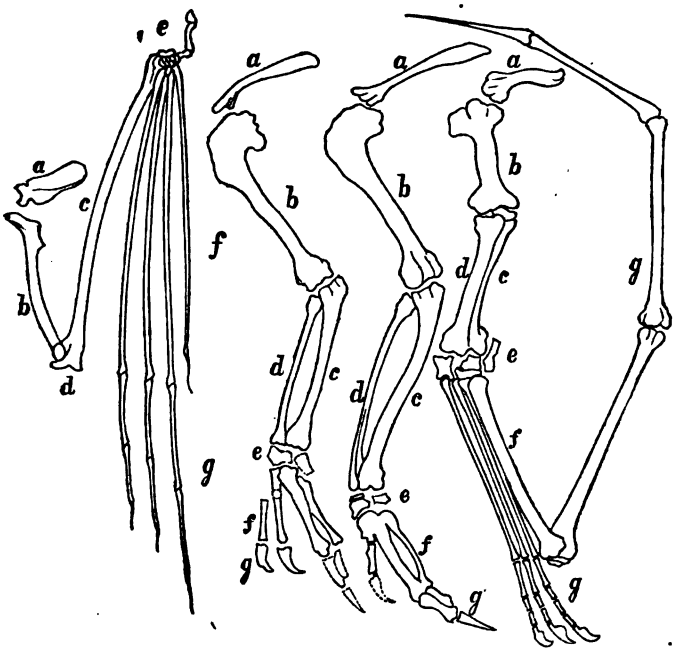
DIAGRAM OF THE BONES OF ANTERIOR EXTREMITIES OF FLYING VERTEBRATES.



I. Bat.—*a*. Scapula. *b*. Humerus. *c*. Radius. *d*. Rudiment of ulna anchylosed to radius. *e*. Carpus. *f*. Metacarpus. *g*. Phalanges.

II. Pterodactyle.—References the same as in Fig. I.

III. Bird.—References as in Fig. I. The dotted outline of the second ungual phalanx indicates the occasional occurrence of a claw at this point. The majority of birds are without it.

IV. Archæopteryx.—References as in Fig. I. The dotted outlines seen at carpus and the terminal phalanges are restored portions.

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In addition to the instances already given, certain fishes, as the *Exocœtus* and *Dactylopterus*, possess the power of sustaining true flight. The mechanism that lifts the body of the fish from the water, and upholds it for a short time in the air, is obtained in the pectoral fins, which, in these animals, are enormously developed. The structure of these fins is homologous to that of the anterior extremities of other vertebrates—their form alone being modified to adapt the animal to the medium in which it is placed. Thus we have, in each great subdivision of vertebrate animals, a representative capable of sustaining flight.

Another somewhat similar modification of the animal economy is met with in a few animals of arboreal habits. Here a peculiar arrangement of the skin is observed, which enables the possessor to break the force of downward leaps. In the Flying Lemur (*Galeopithecus*), in the Flying Squirrel (*Pteromys*), and in the Flying Opossum (*Petaurista*), the furred skin extends laterally from the sides of the body, and is attached to anterior and posterior extremities at the metacarpal and metatarsal regions respectively. The only instance of osteological development is obtained in the Dragon (*Draco volans*), a small lizard from Sumatra, in which long, transverse processes from either side of the lumbar vertebræ support a thin membranous growth which is capable of being opened and shut by means of muscles attached to the bony frame-work.

Anatomy.—From the consideration of the mechanism of the wings of bats, it is an easy transition to speak of their anatomy.

The bones of *Cheiroptera*, though incapable of receiving air from the surrounding medium, are nevertheless of very light

---

class it could be assigned. Its peculiarities consist of a continuation of the bones of the vertebral column posteriorly to the number of twenty segments, thus creating a tail seven inches in length; of the metacarpal bones, being composed of four bones instead of two or three as in living birds; and of the reptilian character of the pelvis.

For descriptions concerning this curious animal the reader is referred to the original paper by M. von Meyer, *loc. cit.*; an article in *The Intellectual Observer*, for Dec. 1862 (with plate), by Wm. H. Woodward; an article in *Amer. Journ. Sci. and Arts*, 2d series, XXXV, May, 1863, 129 (Prof. Dana); an article in *Phil. Trans.* CLIII, part I, 1863, 33, pl. 1 to 4 (Prof. Owen). The last mentioned paper is the most complete on the subject, and is accompanied with a handsome full size plate of the fossil.

It is from this memoir that the outline engraving on the opposite page has in part been taken.

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structure. The skeleton of a bat is expressive of lightness and tenuity. The bones of the common Brown Bat (*V. subulatus*), from which this description is taken, weighed but eleven grains.

The *skull* is of proportionate large size, rounded at cranium The parietal crest, generally faintly produced, is frequently entirely absent; at the superior angle of occipital bone a faintly defined triangular patch is seen in those skulls where the temporal fossæ on either side have not extended quite the length of the side of cranium. Orbit incomplete; temporal fossæ very large; zygomata perfect, generally slightly curvilinear, somewhat depressed in centre. Anterior nares large, sub-circular, extending back on the palate to a level with the canine teeth. Intermaxillary bones rudimentary and not meeting in front. The bones of the cranium are without diploe, and the interior of the skull without tentorium. Auditory bullæ (viz., the circular appendages to the external meatus) very large. Occipital condyles broad; foramen magnum large, sub-oval, somewhat depressed. The maxillary bones are stout, and support all the teeth, excepting the incisors, which are held in position by the inter-maxillary bones.

The *lower jaw* is stout, receding at symphysis, where it is very high, and extends backwards to a level with the 2d premolar tooth; coronoid process high, blunt, strongly marked externally to its base with the concave surface for the insertion of temporal muscle. The anterior border is vertical, the superior and posterior are slightly oblique, ending in the condyloid process; the articulating head of which is arranged transversely to the axis of the bone. The ramus of the jaw is turned slightly outward, and is thin and compressed. A large hamular process is conspicuous immediately inferior to the articulating surface.

The *teeth* are of variable number—being in some species as low as 30, in others as high as 38. This variation, combined with differences in their contour, furnish characters of great importance in the classification of these animals. The principal differences are seen in the number of the incisors and molars. The usual number of incisors is 4 in the upper, and 6 in the lower jaw. The number is never in excess of this, though frequently falling short of it. Thus, in some genera there are but 2 incisors above and 4 below; or there may be none above and but 2 below When the number in the upper jaw is confined to 2 teeth the central incisors are wanting. The number in the lower jaw is

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always 6 in the family *Vespertilionidæ*, with the exception of the Californian genus *Antrozous*, which has here but 4 incisors. In this particular it shows evidence of its affinity with the family *Phyllostomidæ*, in which 4 incisors in the lower jaw is the normal number.

The molars are of two kinds: the true molars, and the false or premolars. The former are the larger and situated most posteriorly, the latter are small, placed between the true molars and the canines, and appear to unite the characters of both these teeth. The premolar adjoining the first molar bears a stronger resemblance to the grinders than to the premolar adjacent to the canine, which shows decided resemblance to the eye tooth. The number of molars (true and false) in any bat never exceeds 6 above and 6 below. In any diminution of this number the first premolar is always wanting.

The minute description of the teeth is reserved for the remarks under each species. It will be well in this place, however, to define the true molars, and since they are not subject to any material variation in shape no mention of them will be made in the text.

The true molars are 3 in number, both above and below. In the upper jaw they are of a sub-triangular shape, wider than long, their bases being outward, and their apices rounded and blunt. The first and second teeth have two V-shaped cusps upon the articulating surface of the crown—the anterior border of each cusp being more prominent than the posterior. The union of these two cusps constitutes what is known as the W-shaped crown. This irregularity is occasioned by the sinuate incurving of the enamel of the tooth; it eminently adapts the organ for the mastication of insect food. The inner portion of the articulating face is lower than the outer, is of a rounded shape, and is furnished with but one cusp, which, however, placed immediately behind the anterior triangular cusp, runs obscurely backwards to behind the posterior cusp, giving these teeth the appearance of being quadri-cuspid. The third molar, much smaller than the preceding, has a straight anterior and a rounded posterior surface; the external face of crown is irregular and sinuate, posterior unicuspid.

In the *lower jaw* the molars are of equal size. They are longer than wide. Each tooth is made up of two V-shaped cusps, their

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bases lying inwards, their apices very acute. The anterior cusp is wider and somewhat higher than the posterior.

The *vertebral column* is remarkable for the absence of any prominent processes. The cervical vertebræ are little more than slender rings of bones surrounding a spinal marrow of unusual width. The dorsal are also very uniform in appearance, each bone having its sides furnished with a slightly elevated tubercle. The *ribs* attached to them are relatively broad, very long, and much curved, thus giving the thorax a somewhat compressed appearance. The first rib is remarkable for its extreme breadth, especially at the point where it articulates with the sternum, being here twice the width of the clavicle. The *sternum* is of great strength. The manubrium is markedly crested, broad and flat at base whence two blunt, obtuse alæ spring from either side to articulate with the clavicle and first rib. The gladiolus and xyphus are large and robust; the latter has upon its inferior extremity an expanded cartilaginous piece, which is continuous with the linea alba. The object of this excessive development of the sternum is evident: the immense power employed in the maintenance of flight necessitating the presence of strong osseous points for attachment of the muscles. The *clavicle* is long, much arched, and slightly flattened from before backwards. The *scapula* is of a sub-rhomboid shape. At the upper third of its dorsal surface the dorsal spine runs obliquely forwards and terminates in the large acromion. The coracoid process is also conspicuous, and projects at right angles from the scapula parallel with a similar process from the internal superior angle of the shoulder blade. The *humerus* is long, cylindrical; head small, scarcely longer than shaft; two processes before and behind the articulation are observed for the insertion of the scapular muscles. The inferior extremity has but one articular facet. The forearm consists of the *radius* alone, the *ulna* being entirely absent or confined to a mere rudiment attached to the upper posterior part of the radius. The radius is slightly arched, much larger than humerus, and like it without any process. The *carpus* is composed of 6 bones, of which the largest supports the radius. The bones of the *metacarpus* are greatly developed in length, constituting the bony frame-work upon which the wing membranes are stretched. The thumb has two joints, the terminal one of which is surrounded by a claw, the others having generally

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three joints each—long and cylindrical. The *pelvis* is slender and narrow. The ilii are elongated, not widened, and markedly convex on outer surfaces; ischia relatively large, and converging; pubis rather slender. The ossa innominata are readily disunited at symphysis, their union to the sacrum being firmer. Obturator foramen large and elliptical. Both *femur* and *tibia* are long cylindrical bones, presenting no features of interest. The *fibula* is slender, acuminate and imperfect; it arises from the base of the tibia, and terminates midway up that bone. By the partial eversion of the lower extremity it appears to lie to the *inner* side of the tibia. The *toes* are five in number and armed with sharply curved claws; the calcaneum is enormously developed as a spicula of bone, running obliquely downwards and inwards towards the tail, and inclosed within the border of the interfemoral membrane. The termination of this bone is abrupt in some species, in others its extremity blends with the free edge of the membrane. The *tail* is composed of nine joints in the majority of bats, which diminish in width from above downwards; the tip of the tail may or may not be included in the interfemoral membrane.

Mr. Thomas Bell, in reviewing the osteology of the bat, uses the following language:—

"The whole of this structure is so perfectly adapted to the peculiar habits of the animals as to require no comment. The great development of the ribs, sternum, and scapula for the attachment of strong muscles of flight; the length and strength of the clavicle; the extension of all the bones of the anterior extremity, all admirably tend to fulfil their obvious end."—*Cyclopedia of Anat. and Phys.*, art. *Cheiroptera.*

The digestive apparatus is very simple, as might be supposed from the nature of the food upon which these animals subsist. The stomach is simple, with small fundus. The intestine is short, measuring but one and a half times the length of the body, and in many species without a cæcum.

The nervous system is highly developed, especially the special senses of hearing and of touch. The ears, both internally and externally, are highly perfected. The cochlea are disproportionately large as compared with the size of the semicircular canals. The ampullæ, as already seen, are very large. To this osseous structure, for the reception of sound, is added the complicated auricle with which all insectivorous bats are provided. These

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are frequently much larger than the head, and of great variety of shapes: their variations of form being of great importance in classification.

The internal border is generally much curved, and terminates in an obtuse or acute projection, called *the internal basal lobe* (*c*); the external border of the ear is of an irregular convex contour, and ends anteriorly in a blunt and thickened fold of membrane—*the external basal lobe* (*d*).[1] The tragus, or oreillon (*e*), is an upright growth of membrane extending from the base of the auricle up the centre of the external ear. The function of this appendage is not known; it probably acts as a valve to prevent foreign substances entering the ear, or to prevent the volume of sound received from such a large auricle in impinging too forcibly upon the delicate tympanum.

The nose is also frequently the seat of extensive dermal growths. These appendages, situated about the nostrils, may be simple upright, triangular folds of skin, or they may be exceedingly complicated in structure. No North American bat, with but one exception (*M. californicus*), has such a development. Though the external ear is evidently intended to augment the sense of hearing, there is some doubt whether the nose leaves hold the same relation to the olfactory sense. These growths are composed of reduplications of skin, and are not related to the lining membrane of the nose. They are probably the agents for augmenting the sense of touch alone, and in this way act conjointly with the wing membranes.

It is in this latter structure that the sense of touch chiefly resides. The bones of the extremities being covered on either side with an enduplication of skin, form a frame-work upon both sides

[1] In the above cut the external basal lobe has been turned backwards to disclose the base of tragus.

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of which the papillæ of touch are extensively distributed. This function, in many places, is probably aided by the delicate hairs which are sparsely distributed linearly upon the under surfaces of the membranes. These may perform a function analogous to that observed in the labial whiskers which are so prominent in the *Felidæ*. Spallanzani was the first to notice the high development to which this sense had been brought in these animals. His experiment is well known, but will bear repetition here:—

"In 1793 Spallanzani put out the eyes of a bat, and observed that it appeared to fly with as much ease as before, and without striking against objects in its way, following the course of a ceiling, and avoiding, with accuracy, everything against which it was expected to strike. Not only were blinded bats capable of avoiding such objects as parts of a building, but they shunned, with equal address, the most delicate obstacles, even silken threads, stretched in such a manner as to leave just space enough for them to pass with their wings expanded. When these threads were placed closer together, the bats contracted their wings, in order to pass between them without touching. They also passed with the same security between branches of trees placed to intercept them, and suspended themselves by the wall, &c. with as much ease as if they could see distinctly."—*Godman's Amer. Nat. Hist.* I, 1831, 57.

Habits.—The habits of these animals are but little known. We possess a general knowledge that they are of nocturnal and crepuscular habits; that they feed upon night insects; that they frequent in their hours of repose secluded retreats in common with other nocturnal animals. To this circumstance, as much as any other, our ignorance of their habits is chiefly due. The darkness and unpleasant surroundings of their haunts are sufficient obstacles to cool the ardor of the most enthusiastic naturalist. Opportunities are offered occasionally, however, to observe their flight, and their habits in repose, by their accidental entrance into the open apartments of our dwellings in warm weather.[1]

[1] In this connection I take the liberty of quoting from Mr. Audubon's "Eccentric Naturalist," a sketch which appeared in the "Ornithological Biography" of that author. The hero of this sketch is well known to have been M. Rafinesque. The incident narrated was one of a series of adventures equally ludicrous which Mr. Audubon graphically narrates:—

"When it was waxed late I showed him to the apartment intended for

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Under these circumstances they can be readily caught, and although bearing captivity poorly, can yet with care be sustained for some time. In this condition they will take small pieces of raw meat with avidity, though—strange as it may appear—refuse to partake of insects. They appear to drink largely of water. A small Brown Bat, which I once caught and caged, would lap up water eagerly when all food was refused.

The first act of the bat, after emerging in the evening from its retreat, is to fly to the water. The following account illustrating this peculiarity, as well as showing the enormous numbers in which these animals will live together, is of great interest. It is from the pen of M. Figaniere, Minister to this country from Portugal, in a letter addressed to Prof. Henry, Secretary of Smithsonian Institution:—

"In the winter of 1859, having purchased the property known as Seneca Point, on the margin of the Northeast River, near Charlestown, in Cecil County, Maryland, we took possession of it in May of the next year. The dwelling is a brick structure covered with slate in the form of an L, two-storied, with garret, cellars, and a stone laundry and milk house attached. Having been uninhabited for several years it exhibited the appearance, with the exception of one or two rooms, of desolation and neglect, with damp, black walls, all quite unexpected, as it had been but very slightly examined, and was represented in good habitable condition, merely requiring some few repairs and a little painting.

"The boxes, bundles and other packages of furniture which had preceded us, lay scattered around and within the dwelling: these, with the exception of some mattresses and bedding for

him during his stay, and endeavored to render him comfortable, leaving him writing material in abundance. I was indeed heartily glad to have a naturalist under my roof. We had all retired to rest. Every person I imagined was in deep slumber, save myself, when of a sudden I heard a great uproar in the naturalist's room. I got up, reached the place in a few moments, and opened the door, when, to my astonishment, I saw my guest running about the room naked, holding the handle of my favorite violin, the body of which he had battered to pieces against the walls in attempting to kill the bats, which had entered by the open window, probably attracted by the insects flying around his candle. I stood amazed, but he continued running round and round, until he was fairly exhausted; when he begged me to procure one of the animals for him, as he felt convinced they belonged to a 'new species.'"

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immediate use, were hastily arranged for unpacking and placing in order at leisure. The weather, which was beautiful, balmy and warm, invited us towards evening to out-door enjoyment and rest after a fatiguing day of travel and active labor; but chairs, settees and benches were scarcely occupied by us on the piazza and lawn, when to our amazement, and the horror of the female portion of our party, small black bats made their appearance in immense numbers, flickering around the premises, rushing in and out of doors and through open windows—almost obscuring the early twilight, and causing a general stampede of the ladies, who fled covering their heads with their hands, fearing that the dreaded little vampires might make a lodgment in their hair.

"This remarkable exhibition much increased our disappointment in regard to the habitable condition of our acquisition, and was entirely unexpected, inasmuch as the unwelcome neighbors were in their dormant state and ensconced out of sight, when the property was examined previous to purchase. With their appearance and in such immense numbers the prospect of immediate indoors arrangement and comfort vanished; the paramount, the urgent necessity was to get rid of such a nuisance as quickly as possible, and the question was by what means could this be accomplished. Our scientific friends and acquaintances, both in New York and Philadelphia, were consulted, various volumes of natural history were examined in order to ascertain the peculiar habits of the vermin, but we derived no effectual consolation from these sources. One of our friends, indeed, sent us from New York an infallible exterminator in the form of a receipt obtained at no inconsiderable cost: strips of fat pork saturated with a subtle poison were to be hung up in places where the annoying 'creatures' did most congregate; of this they would surely eat, and thus 'shuffle off their mortal coil.' How many revolving bat seasons it might have required by this process to kill off the multitude, the urgency of the case would not allow us to calculate, and the experiment was therefore abandoned.

"Evening after evening did we patiently, though not complacently, watch this periodical exodus of dusky wings into light from their lurking places one after another, and in some instances in couples and even triples, according as the size of the holes or apertures, from which they emerged, in the slate roofing would permit. Their excursions invariably commenced with the cry of

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the '*whippoorwill*,' both at coming evening and at early dawn; and it was observed that they always first directed their flight towards the river, undoubtedly to damp their mouse-like snouts, but not their spirits, for it was likewise observed that they returned to play hide and seek, and indulge in all other imaginable gambols: when, after gratifying their love of sport and satisfying their voracious appetites (as the absence of mosquitos and gnats testified), they would re-enter their habitation, again to emerge at the first signal of their feathered trumpeter. I thus ascertained one very important fact, namely, that the bat, or the species which annoyed us, ate and drank twice in twenty-four hours. Such appeared their habit, such therefore was their indispensable need. Upon ascertaining this fact, after having tried suffocation by the fumes of brimstone with only partial success, I concluded to adopt a more efficient plan of warfare; and for this purpose commenced by causing all the holes, fissures in the wood-work, and apertures in the slating to be hermetically sealed with cement: this put a stop to their egress; but to avoid their dying by starvation and deprivation of water, which would manifold increase the annoyance by adding their dead to their living stench, I ordered apertures of about two feet square to be opened in the lathe and plastered partition on each side of the garret windows, and also in the ceiling of every garret room; lastly, when the bats' reveille was sounded by the bugle of the *whippoorwill*, all the hands of our establishment, men and boys, each armed with a wooden implement (shaped like a cricket bat), marched to the third floor, 'on murderous deeds with thoughts intent:' a lighted lantern was placed in the middle of one of the rooms, divested of all furniture, to allure the hidden foe from their strongholds. After closing the window to prevent all escape into the open air, the assailants distributed at regular distances to avoid clubbing each other, awaited the appearance of the bats enticed into the room by the artificial light and impelled by their own natural craving. The slaughter commenced, and progressed with sanguinary vigor for several hours, or until brought to a close by the weariness of dealing the blows that made the enemy bite the dust, and overpowered by the heat and closeness of the apartment. This plan succeeded perfectly. After a few evenings of similar exercise, in which the *batteurs* became quite expert in the use of their weapon, every wielding of the wooden bat bringing down an expiring name-

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sake, the war terminated by the extermination of every individual of the enemy in the main building. However, there still was the cock-loft of the laundry, which gave evidence of a large population. In this case I had recourse to a plan which had been recommended, but was not carried out in regard to the dwelling-house. I employed a slater to remove a portion of the slating which required repairing. This process discovered some fifteen hundred or two thousand bats, of which the larger number were killed, and the remainder sought the barn, trees, and other places of concealment in the neighborhood.

"In the main building nine thousand six hundred and forty bats, from actual counting, were destroyed. This was ascertained in the following manner: After the battling of each evening the dead were swept into one corner of the room, and in the morning, before removing them to the manure heap, they were carefully counted and recorded; many had been killed before and some few after the reckoning was made, and were not included in it, nor were those killed under the adjoining laundry roof. The massacre commenced by killing fewer the first evenings, the number increasing, and then diminishing towards the end; but it was generally from fifty or a hundred, up to six hundred and fifty—the highest mortality of one evening's work—dwindling down to eight, five, three, and two.

"This species of bat is generally small, black, and very lively. Some smaller than the ordinary size were found, probably young ones, and one or two larger, supposed to be grandfathers, of a reddish hue, which was thought to be from age. These vermin were generally more or less covered with a small sized bug, not very dissimilar to the common chinch, but of a different species. As previously stated, the bat has a very disagreeable odor, which also pertains to its ejection.

"The manure, as well as the bodies of the slain, was used to fertilize the flower and vegetable garden, and thus, in some degree, they served to compensate us for the annoyance to which we had been subjected. The manure, however, required to be applied with caution, since, if used in too large a quantity, it appeared to burn the organism of the plants.

"To remove the very disagreeable odor which remained in the upper part of the house, various kinds of disinfectants were employed with some advantage; but the most effectual method re-

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sorted to was that of opening holes of about four inches square, two at each gable end, to permit a current of air to pass through. These holes were covered with iron gauze, to prevent the re-entrance of any of the remainder of the army of the enemy which might hover around the premises.

"At the end of five years the odor has now nearly disappeared, being hardly perceptible during a continuance of very damp weather."

The fact mentioned above of the numerous parasites infesting bats is perhaps the most revolting feature in these creatures. The enormous population of *Acari* found upon their bodies is due to the great generation of animal heat in their close haunts, a condition conducive to a rapid increase of all kinds of vermin. In this country the common bed-bug (*Cimex lectularis*) is frequently found upon their fur. The entrance of a bat, with its precious burden, into the open window of a farm house is the solution of that frequently propounded question of the despairing housewife: "Where *can* the bugs come from?"

Of individual anecdotes of bats we have but few examples. The following, illustrating the maternal instinct, is taken from Godman's Nat. Hist. I, 1831, 56. It is narrated by Mr. Titian Peale:—

"In June, 1823, the son of Mr. Gillespie, the keeper of the city square, caught a young Red Bat (*L. noveboracensis*), which he took home with him. Three hours afterwards, in the evening, as he was conveying it to the Museum, in his hand, while passing near the place where it was caught, the mother made her appearance and followed the boy for two squares, flying around him and finally alighted on his breast, such was her anxiety to save her offspring. Both were brought to the Museum—the young one firmly adhering to its mother's teat. This faithful creature lived two days in the Museum, and then died of injuries received from her captor. The young one, being but half grown, was still too young to take care of itself, and died shortly after.'

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ARTIFICIAL KEY TO THE GENERA.

I. ISTIOPHORA.

(Bats with upright appendage on nose.)

MEGADERMATIDÆ.

Nose leaf simple, triangular, acuminate. . . . *Macrotus.*

II. GYMNORHINA.

(Bats without upright appendage on nose.)

A. Nostrils circular; wing membranes narrow; tail either much longer or much shorter than interfemoral membrane . . . . NOCTILIONIDÆ.

Lips grooved . . . . . *Nyctinomus.*

B. Nostrils subelliptical; wing membranes ample; tail inclosed in interfemoral membrane—the final joint in some instances exserted . . . . . VESPERTILIONIDÆ.

a. Two incisors in upper jaw.

† Six incisors in lower jaw.

* Interfemoral membrane more or less hairy . . . *Lasiurus.*

** Interfemoral membrane not hairy . . . . *Nycticejus.*

‡ Four incisors in lower jaw . . *Antrozous.*

b. Four incisors in upper jaw.

† Molars $\frac{6}{6}$; internal basal lobe of ear acute . . . . *Vespertilio.*

‡ Molars less than $\frac{6}{6}$; internal basal lobe of ear rounded.

* Nose with two symmetrical excrescences . . . *Synotus.*

** Nose without excrescences . *Scotophilus.*

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MONOGRAPH

OF

NORTH AMERICAN BATS.

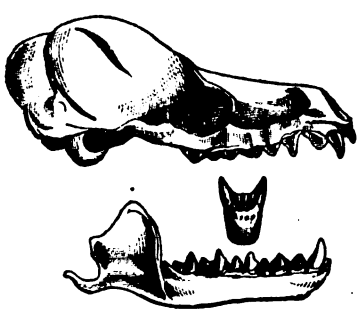
Fam. MEGADERMATIDÆ.

MACROTUS, Gray.

Macrotus, Gray, Pr. Zool. Soc. 1843, 21.

Ears large, joined; leafy appendage simple, erect; interfemoral membranes large; point of tail free.

Fig. 1.



Macrotus californicus.

Skull thin, light, tapering. The cranium inflated; parietal crest small.

Dentition.

Molars $\frac{5}{6}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{4}$. Canines $\frac{1}{1}$. Molars $\frac{5}{6}$ = 34 teeth.

Upper Jaw.—The incisors disproportionate; the central large and chisel-shaped; the lateral small, pointed, and converging. Canines small, slightly concave on inner, convex on outer surface;

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no basal cusps. First premolar of peculiar shape, thin and compressed. It is unicuspid, with a small posterior basal point visible from without. The second is thicker, and has an internal basal ridge. The third and fourth molars not peculiar. The fifth is small, greatly compressed from within outwards.

Lower Jaw.—Incisors crowded, indistinctly trilobed; canines with a marked basal cusp. The first and second premolars of about equal size, thick, with basal ridge. The remaining molars not peculiar.

In placing this genus under *Megadermatidæ* it should not be considered as having any strong affinity to the genus *Megaderma*. When a family or subfamily is extensive, the first and last members of it often differ considerably from one another; and in the present instance the genus *Megaderma* may be considered to stand at one end of the subfamily, while *Macrotus* is at the other, the intervening members being wanting.

The nose leaf of *Megaderma* is complex and naked, that of *Macrotus* is simple and hairy. *Megaderma* has no tail, while that of *Macrotus* is produced beyond the interfemoral membrane. *Macrotus* has some resemblance to that group of *Phyllostomatidæ*, of which *Glossophaga* is the type. The head has the same long, rostroid appearance, the small acuminated nose leaf, the cleft in the lower lip, and the abrupt interfemoral membrane. The genus, in fact, appears to stand between *Megadermatidæ* and *Phyllostomatidæ*.

The genus *Macrotus* was established by Gray in the Proc. Zool. Soc. for 1843, p. 21, upon specimens of *M. waterhousii* brought from Hayti by Dr. Parnell. The description was very brief, and accompanied by no mention of the dentition.

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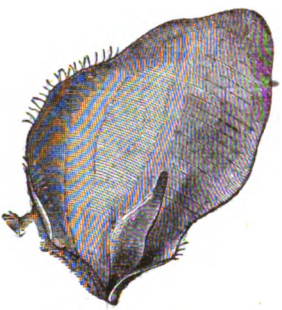
Macrotus californicus, BAIRD.

Fig. 2.

Fig. 3.



Macrotus californicus, BAIRD, Proc. Acad. Nat. Sc. Phila. 1858, 117.—IB. Rep. U. S. and Mex. Bound. Surv. II, 1859, Mammals, p. 4, pl. i, fig. 2.

Description.—Head long. Face hairy. Eyes rather large, almond-shaped. Nose leaf acuminate, higher than broad, its narrow nostrils placed in its base obliquely. Ears very large, united over the head by an incised, transverse membrane; they are oval and slightly hairy. Tragus not quite half as high as the auricle; lanceolate straight on outer border, where at base there is an abrupt increase in width with a slight revolution posteriorly; inner border not thickened, the upper half concave, lower half convex. Lower lip cleft, shield triangular acute. Thumb slender, long; basal joint shortest. Tail produced two lines beyond the interfemoral membrane. The calcaneum large. Wing membrane extends to ankle; in some specimens it seems to arise by a slight attachment from the calcaneum in the same manner as in the genus *Natalus*. Foot moderate, with short compressed hairs on upper surface, claws rather large.

The fur is indistinctly tricolored. Above, base white, terminal third fawn, its tip gray. Below, base likewise white, terminal third fawn, its tip white—thus giving the fur a grizzled, wavy appearance. The hair about the face is shorter and more inclined to brown. Immediately behind the junction of the ears the head is almost naked. The basal portions of the ears have growths of hair upon them which may be contiguous in the living animal.

This species is closely related to *M. waterhousii*, Gray, of Cuba, Hayti, and other West Indian Islands; but a comparison

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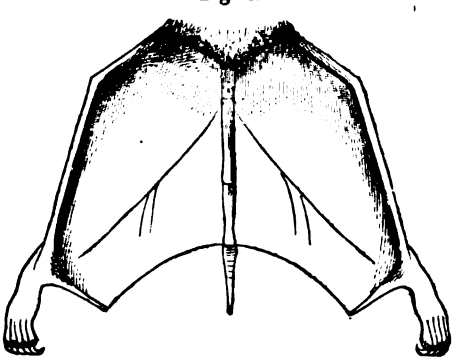
of the type with good specimens of the latter from Cuba, preserved in alcohol, and presented by Prof. Poey to the Smithsonian Institution, show unmistakable differences, as do others from Jamaica, recently received from Mr. March.

The chin plates are less acutely defined; the internal border of the tragus is much thickened, and the revoluted portion at the base of the external border is slightly swollen. The fur is bicolored; central portion dark-brown instead of fawn. The nose leaf is of about the same height as in the above species; the tail, however, is .25 of an inch shorter. The dentition is similar.

The *M. mexicana*, Saussure, is a species from Mexico described by M. Saussure in Revue et Mag. de Zool., 2d series, XII, 1860, p. 486. The author states that the description is taken from a specimen which was in poor condition. It is difficult to tell from his description whether his species is the same as *M. californicus* or not.

Fig. 4.



Macrotus californicus.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Height of nose-leaf.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
2347		2.3	1.6	0.2	1.10	0.9	3.3	0.5	1.1	0.5	10.0	Alc.
5214	417	2.0	1.3	0.2	1.8	0.8	3.0	0.5	1.0	0.4½	10.0	"
5214*a*	411	2.0	1.4	0.2	1.10	0.10	3.2	0.4	1.2	0.5	10.0	"
5214*b*	410	2.0	1.3	0.2	2.0	0.10	3.0	0.5	1.0	0.4½	10.0	"
5214*c*	797	2.0	1.2	0.2	2.0	0.8	3.0	0.5	1.0	0.5	11 0	"
5214*d*		2.0	1.4	0.2	1.8	0 10	3.0	0.5	0.11	0 4	10.6	"
5214*e*	412	2.0	1.4	0.2	1.9	0.9	3.0	0.5	1.0	0.6	11.0	"
6174	415	2.0	1.3	0.2	1.8	0.8	3.0	0.5	1.0	0.5	10.6	"

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LIST OF SPECIMENS.

Cat. No.	Specimens.	Locality.	Presented by	Nature of Spec'n.
2347	1	Fort Yuma, Cal.	Maj. G. H. Thomas.	In alcohol (type).
5214	28	Cape St. Lucas.	John Xantus.	In alcohol.
6174	1	Cape St. Lucas.	John Xantus.	In alcohol.

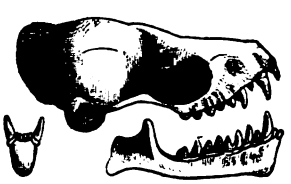
FAM. NOCTILIONIDÆ.

NYCTINOMUS, GEOFF.

Nyctinomus, ET. GEOFFROY, Desc. de l'Egypte (Hist. Nat.), II, 1814.—IS. GEOFFROY, Ann. des Sc. Nat. I, 1824, 337.—CASTELNAU, Exp. d'Amer. Sud; Mammif. pl. xii, f. 2.

Ears generally joined; lips thick, pendulous, grooved; nose sharp, well defined; tragus obtuse, broad and square; tail produced beyond the interfemoral membrane nearly half its length; great toes separated from the others, and fringed on their outer side.

Fig. 5.



N. nasutus.

Skull.—The cranium is inflated, with no appearance of crest, and very papery. The anterior nares small. Intermaxillary bones rudimentary; facial angle small. Auditory capsules large. Lower jaw slender and elongated.

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Dentition.

Molars $\frac{5}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{4}$. Canines $\frac{1}{1}$. Molars $\frac{5}{5}$=30 teeth.

Upper Jaw.—Superior incisors converge but do not touch. The first premolar is very small, but not hidden; the second has a sharp, well defined internal cusp. The internal cusp of the third upper molar has a posterior prolongation; last molar large.

Lower Jaw.—The incisors are very small, bilobed and crowded. The canines are slender, with an internal cusp, which does not meet its fellow in the middle line. Two premolars of nearly equal size, unicuspid, the posterior being a little the larger. The remaining three molars are in nowise peculiar.

A singular confusion has always existed in the efforts of naturalists to accurately determine the forms of the Molossoid group of the Noctilionidæ.

The names of *Vespertilio, Molossus, Dysopes, Dinops* and *Nyctinomus*, have been applied almost indiscriminately to the different species. Geof. St. Hilaire established the genus *Molossus*, in 1805, in Ann. du Mus. VI, 150. In 1814, he founded the genus *Nyctinomus* in the "Description de l'Egypte." As far as my observation has been extended, it is among these two genera that the different species can be properly grouped, excepting perhaps the form *Cheiromeles*, Horsf. *Molossus* is an American genus. *Nyctinomus* has an extensive distribution, being found in Africa, Australia, and America. Peters, in "Reise nach Mozambique," has described two African species under the names of *Dysopes brachypterus* and *limbatus*, but the figured skulls and heads correspond exactly to those of *Nyctinomus*. Tomes, while adverse to the separation, states that if separated, *Molossus australis*, Gould, from Australia, belongs to *Nyctinomus*. Horsfield's elaborate and sagacious researches in Asia have brought to light *N. tenuis;* and finally, Is. St. Hilaire noticed as early as 1824 (Ann. des Sc. Nat., April, 1824), the prevalence of the genus in America.

Nyctinomus can readily be distinguished from *Molossus* by the following characters:—

Molossus. Superior incisors converge and touch. Molars four in upper jaw; internal cusp of third molar not prolonged

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posteriorly; last molar small. Skull not markedly broad. Lips thick and heavy, but not furrowed. Nose rounded. Tragus a mere point of integument.

Nyctinomus. Superior incisors converge but do not touch. Molars in upper jaw five; internal cusp of third upper molar having a posterior prolongation; last molar large. Skull broad. Lips very pendulous and furrowed. Nose sharp, well defined. Tragus obtuse, broad, and square.

Nyctinomus nasutus, Tomes.

Fig. 6.

Fig. 7.

Molossus nasutus, Spix, Sim. et Vesp. Bras., 1823, 60, pl. xxxv, fig. 7; *fide* Isis, August, 1824, 899 (Brazil).—Schinz, Syn. Mamm. I, 1844, 143.

Dysopes nasutus, Temm., Mon. Mamm. I, 1827, 234.—Ib. Zool. Jour. III, 1828, 459.—Wagner, Suppl. Schreber, I, 1844, 474.—Ib. V, 1855, 711.

Nyctinomus nasutus, Tomes, Pr. Zool. Soc. Lond. 1861, 68 (Jamaica).

Nyctinomus brasiliensis, Isid. Geoff., Ann. des Sc. Nat. I, April, 1824, 337, pl. xxii (Brazil).—Ib. Zool. Journ. I, 1825, 133.—Ferussac, Bull. des Sc. Nat. II, 1824, 74.

Nyctinomus murinus, Gray, Griffith's Cuv. Ann. Kingdom, V, 1828, 66.

Nycticea cynocephala, Leconte, Cuv. An. Kingdom (McMurtrie) I, 1831, 432 (South Carolina).

Molossus cynocephalus, Cooper, Ann. N. Y. Lyc. IV, 1837, 65, pl. iii, fig. 1.—Wagner, Suppl. Schreber, V, 1855, 714.

Molossus fuliginosus, Cooper, Ann. N. Y. Lyc. IV, 1837, 67, pl. iii, f. 3 (S. Carolina.)

Rhinopoma carolinensis, Gundlach, Archiv f. Natur. 1840, 358, (not of Geoff., in Desm. Mamm. 1820, 130, and Dict. d'Hist. Nat. XLV, 1829). —Leconte, Pr. A. N. Sc. Phil. VII, 1855, 437.

? *Dysopes naso*, Wagner, Suppl. Schreb. I. 1840, 475, based on *Nyctinomus brasiliensis*, Geoff.

Nyctinomus mexicanus, Sauss., Rev. et Mag. de Zool. XI, 1860, 283.

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Description.—Head rather large; made to appear more so by the heavy pendulous lips. Ears broad as high, obtusely square, almost joining on top of the head; on their inner anterior border five minute warts are observed. The outer border is emarginate at its upper, strongly concave at its lower portion, where at its basal third it is doubled upon itself. The mouth has upon it a bristled wart. The tragus is small, very obtuse; the outer border rather the longer. It is furnished at the tip with three or four bristles. The sides of the face are very little swollen. The inflated portions are continuous with the inner border of the ear, and both it and the pendulous lips, which are crimped into eight perpendicular lines, are studded with stiff bristles some three lines in length, those near the mouth being shorter. The snout is prominent, produced, truncated, and emarginate; a little ridge runs down the median line. The upper margin is beautifully crenulated, the lower is thickly set with a row of projecting setae, between which and the base of the nostrils runs a deep groove. The nostrils themselves are simple, rounded, and open sublaterally. The lower lips are thick but not crimped; they are quite bristly, and a small median wart is placed three lines from the mouth.

The fur is thick, short, soft, and almost entirely confined to the body. Above it is dark fawn at tip, with a base of a whitish hue. It extends up upon the back of the ears one-third their height. There is a very delicate patch on the interbrachial membrane. In front the color is light cinereus at base; tip a delicate fawn. Thumb moderate. Foot large; toes furnished with long hairs; the first and fifth fingers with numerous and thicker hairs in addition.

Nyctinomus nasutus, Tomes, has been selected as the name of this species after careful search. For a long time, *N. brasiliensis*, Is'd. Geof., was thought to have the priority, but the reference following *Dysopes nasutus*, Spix, in the above synonymy, shows clearly that this description has the priority of one year over the former. Mr. Tomes's name follows the title, since he was the first to give it its proper name.

Geoff. St. Hilaire, after founding the genus *Nyctinomus*, is said to have described a bat from North America, which was called *Rhinopoma carolinensis*. This is considered by Major Leconte to be the same as the species under consideration. But *Nyctinomus* has a naked nose, while *Rhinopoma* has a well developed noseleaf and operculum. There has been no figure given of this

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animal, but a glance at a figure of another species of the same genus, *R. macrophylla*, Geoff., Plates of the "Description de l'Egypte," pl. i, fig. 1 (erroneously entitled *Taphozous filet*), will at once show the wide differences existing between *Rhinopoma* and *Nyctinomus*. I have discarded Geoffroy's name, therefore, thinking it very probable that it has had an erroneous locality thrust upon it.[1] It is somewhat singular that Major Leconte should have adopted this name at the sacrifice of his own—*Nycticea cynocephala*—upon the bare supposition that the specific name, *carolinensis*, might lead to the conclusion that *Rhinopoma* had been found in North America. As far as I have been enabled to observe, there are no leaf-nosed bats whatever inhabiting the Atlantic slope of the United States.

The species *M. cynocephalus* and *fuliginosus*, of Mr. Cooper, evidently refer to the same animal; the minute differences observed in the ears are due to the circumstance that Mr. Cooper's descriptions were taken from dried specimens.

There is no longer much doubt about the extensive distribution of this species. Mr. Tomes[2] has examined specimens from different South American localities, and he affirms that they are identical with those obtained from South Carolina. I have also examined a specimen from Hayti, and another from Buenos Ayres, both of which belong to the Mus. Comp. Zoology, Cambridge, and they appear to be precisely similar to the more northern individuals.

It may be proper to state that Wagner considers the *Molossus nasutus* of Spix to be different from *Nyctinomus brasiliensis* of Geoffrey (=*D. nasutus*, Temm.), and gives the name of *D. naso* to the latter species. Burmeister also applies the latter name to a species found about Buenos Ayres (Reise durch die La Plata Staaten, II, 1861, 392) and in Chile.

[1] "This (*N. nasutus*) has been supposed by Major Leconte and others to be the *R. carolinensis* of M. Geoffroy; but having examined the types of this species in the Paris Museum, I am enabled to state that this is not the case. The *R. carolinensis* is a small *Molossus* from West Africa and Bourbon (*M. acetabulosus* = *M. natalensis*)."—Tomes, Pr. Zool. Soc. 1861, p. 68.

[2] "I have received specimens from many localities in South America and have compared them with others from Central America, and with the types of *N. brasiliensis* in the Paris Museum; and again with specimens of *N. fuliginosus* from Charleston, S. C., whence they had been sent by Dr. Bachman, and I find them to be all one species."—Tomes, *loc. cit.*

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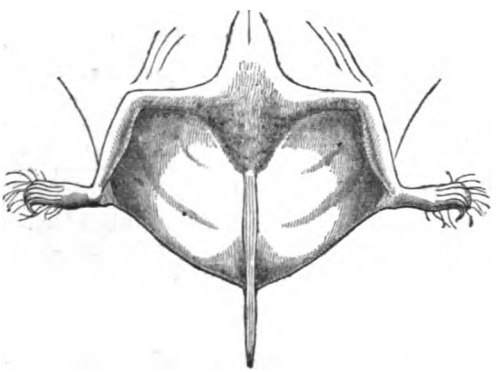
MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5253	..	2.6	1.3	1.7	0.6	3.0	0.4	0.7	0.2	11.0	Alcoholic.
5494	..	2.6	1.1	1.9	0.6	3.0	0.4	0.7	0.2	10.3	"
	..	2.6	1.0	1.7	0.6	3.2	0.4	0.6	0.2	10.0	"
5227	..	2.4	1.3	1.6	0.6	3.2	0.4½	0.6	0.2	9.9	"
5219	..	2.3	1.3	1.6	0.6	3.0	0.3	0.7	0.2	10.0	"
	..	2.3	1.2	1.7	0.6	3.0	0.3	0.7	0.2	10.6	"
	..	2.0	1.3	1.6	0.5	3.0	0.3	0.7	0.2	10.4	"
5225	..	2.2	1.2	1.6	0.6	3.0	0.3	0.7	0.2	10.3	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5475	1	Upper Rio Grande.	Dr. T. C. Henry.	Dry.
5473	1	El Paso.	J. H. Clark.	"
5225	1	Eastern Texas.	" "	Alcoholic.
5219	3	Pecos to R. Grande.	Capt. J. Pope.	"
5496	2	Grand Coteau, La.	St. Chas. Coll.	"
5223	1	Matamoras.	Lt. Couch.	"
5227	1	Fort Yuma, Cal.	Maj. G. H. Thomas.	"
4742	1	"U. S."	Maj. Leconte.	Dry.

Fig. 8.



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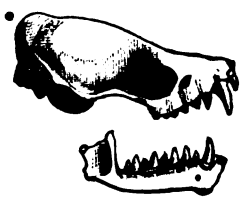
FAM. VESPERTILIONIDÆ.

NYCTICEJUS, RAF.

Nycticejus, RAF., Journal de Physique, LXXXVIII, 1819, 417.

Head short, broad, flat; ears small, simple, widely separated; upper incisors two; membranes naked.

Fig. 9.



N. crepuscularis.

Skull.—Intermediate between that of *Scotophilus* and that of *Lasiurus*, flat, but not to the extent seen in the former; cranium inflated, but not so much as in the latter. It is not elevated; the occipital elevation is not abrupt. Compared with that of *L. noveboracensis*, a bat of nearly the same size, it is longer, and face more pointed. The palate is more level and does not slope so much at its posterior part. The infraorbital foramen is larger, with a slight tendency toward the formation of a groove. The lower jaw is less abrupt; the incisors are placed more anteriorly to the canines in a larger arc.

Dentition.

Molars $\frac{4}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{6}$. Canines $\frac{1}{1}$. Molars $\frac{4}{5}$=30 teeth.

Upper Jaw.—Incisors small, contiguous to canines, and slightly converging; canines large, simple. Molars not peculiar. The first more slender and longer than the others, but not so broad; destitute of the W-shaped crown.

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Lower Jaw.—Incisors not crowded, bifid. Canine simple, turned markedly backward; basal ridge anteriorly well developed; first premolar larger than the same tooth in *Lasiurus*, but in comparison with the second is of itself small. The second premolar, if produced, would not touch an extended line from the canine The basal ridges of both these teeth are large. Molars proper, not peculiar.

This genus of Rafinesque's has until recently held an uncertain position. As imperfectly defined by its describer the presence of two incisors only, in the upper jaw, was brought out as the prominent generic characteristic. But, as it was afterwards observed, the incisors are variable, the young, it was thought, having four incisors, the adult but two. And even this observation applied more to the genus as then understood than to it as now restricted; for the above fact in relation to the dentition is also observed in *L. noveboracensis*. So we conclude that the presence of but two incisors in the upper jaw of *Nycticejus* is still a permanent character, though not a very important one.

Nycticejus crepuscularis, Allen.

Fig. 10.

Fig. 11.

Vespertilio crepuscularis, Lec., Cuv. An. Kingdom (McMurtrie ed.), I, 1831, 432.—Ib., Proc. Acad. Nat. Sci. VII, 1855, 433.
Vespertilio creeks, Fr. Cuv. Nouv. Ann. du Mus. I, 1832, 18.
Nycticejus humeralis, (?) Raf., Journal de Physique, LXXXVIII, 1819, 417.

Description.—Ears small, internal basal lobe small and curved; the external basal lobe also rather inconspicuous; between the

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latter and the angle of the mouth a small wart is present. Tragus straight on internal, irregularly convex on outer border. Face black; nostrils simple, not produced, very little emarginated; sides of face much swollen. Lower jaw has a rather large naked space at chin. Eyes small, with a wart above on either side. Thumb moderate. Membranes blackish-brown, extending to base of toes. Feet rather small, slightly haired above. Interfemoral triangular, moderately ample. Calcaneum slight. Tip of tail exserted.

The general expression is thus observed to be that of *Scotophilus*, but it differs from that genus in the blackish hue of the membranes of ear and skin of face, and in the smallness of the former.

The fur is rather scanty, with the exception of a small patch at base of the interfemoral membrane; before and behind there is no hair on the membranes. The lower third of posterior surface of ears is covered with soft hair. The fur is inclined to be woolly; everywhere it is rather short. That of the back is dark fawn for the upper half, the lower half being a lighter hue bordering on brown. In front the color is more uniform and lighter, being plumbeous at base, light brown at tips. In one specimen, No. 882, Georgia, Phila. Acad., the fur runs on to the membranes before and behind midway to the elbow. In another, No. 283, Carlisle, Pa., the coloration in front resembles *V. subulatus*, Say, that of the back more brownish.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5312	..	2.0	1.5	1.4	0.6	2.6	0.4	0.4	0.2½	9.6	Alcoholic.
	..	2.0	1.5	1.4	0.6	2.6	0.4	0.5	0.2	9.9	"
	..	2.0	1.5	1.4	0.6	2.5	0.3	0.4	0.3	9.3	"
5313	..	2.0	1.4½	1.4	0.6	2.6	0.3	0.4	0.3	9.3	"
5322	..		1.5	1.4	0.6	2.6½	0.4	0.5	0.3		"
5329	..	2.0	1.2	1.3	0.6	2.3½	0.4	0.4	0.2½	9.3	"
	..	2.0	1.2	1.6	0.6	2.7	0.4	0.4½	0.2½	9.9	"
4735	..	2.0	1.2	1.3	0.6	2.5	0.4	0.4	0.2	8.6	Dry.
4736	..	2.0	1.2	1.3	0.6	2.1	0.3	0.3½	0.2	7.9	"
111	..	1.6				2.2	0.3	0.4	0.2		"
283	..	1.9	1.4	1.4	0.6	2.2	0.3	0.4	0.2½	7.6	"
882	..	2.0	1.3	1.5	0.6	2.4	0.3	0.6½	0.3	8.0	"

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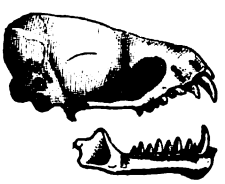
LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'm.
5448	1	Carlisle, Pa.	S. F. Baird.	Dry.
5350	1	Washington, D. C.	?	Alcoholic.
5312	2	Liberty Co., Ga.	Dr. Jos. Jones.	"
5313	1	New Orleans.	N. O. Academy.	"
5300	1	St. Louis, Mo.	Dr. G. Engelmann.	"
5322	1	Nebraska.	Dr. Cooper.	"
5397	1	Redmond's Ranch, Tex.	J. H. Clark.	"
5372	3	Matamoras, (Berl. Col.).	Lt. D. N. Couch.	"
5329	2	" "	" "	"
4736	1	"U. S."	Maj. Leconte.	Dry.
5539	1	?	?	"

LASIURUS, RAF. (?)

Head depressed, lips slightly fringed; nostrils wide apart; skull flat, massive; occipital crest prominent.

Fig. 12.



Lasiurus noveboracensis.

Skull broad, high, sub-angular; facial line abruptly elevated; marked depressions in the facial bones in the median line; zygomas complete.

Dentition.

Molars $\frac{5}{5}$ or $\frac{4}{5}$. Can. $\frac{1}{1}$. Inc. $\frac{2}{6}$. Can. $\frac{1}{1}$. Mol. $\frac{5}{5}$ or $\frac{4}{5}$ = 32 or 30 teeth.

Superior incisors stout, placed close beside the canines.

In the young animals the number of incisors in the upper jaw, four.

The name, *Lasiurus*, it has been asserted, was first applied to

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a genus of *Vespertilionidæ* by Rafinesque. Dr. Gray,[1] quoting this author, adopts the name but without defining the genus. Mr. Tomes, in his Monograph of *Lasiurus*,[2] while dwelling at length on the species, says nothing of the characters common to them all, nor have I been able to find in any author the desired information as to who gave the original description and where its record is to be found. It appears, nevertheless, that naturalists have readily recognized the propriety of considering *Lasiurus* as distinct from *Vespertilio*.

The following is a synopsis of the species included under *Lasiurus*:—

a. Posterior surface of interfemoral membrane concealed by hair.
Border of ear light brown . . . . . *L. noveboracensis*.
Border of ear black . . . . . *L. cinereus*.

b. Posterior surface of interfemoral membrane exposed. *L. intermedius*.

Lasiurus noveboracensis, Tomes.

The Red Bat.

Fig. 13.

Fig. 14.

Vespertilio noveboracensis, Erxl. Syst. Reg. Anim. 1777, 135.—Harlan, Fauna Amer. 1825, 20.—Godman, Amer. Nat. Hist. I, 1826, 50.—Cooper, Ann. Lyc. Nat. Hist. N. Y. 1837, 57.—DeKay, Nat. Hist. N. Y. (Zool.) 1842, 6, pl. ii.—Leconte, Proc. Acad. Nat. Sci. 1855, 432.

Nycticejus noveboracensis, Leconte, Cuv. Regn. Anim. (McMurtrie's) Ap-

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[1] List of the species of Mammalia of the British Museum, 1843, 32.

[2] Proc. Zool. Soc. XXV, 1857, 34.

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pendix, 1831, 432.—Temm. Monog. II, 1835–1841, 158.—Wagner, Suppl. Schreb. Säug. I, 1840, 546.—Ib. V, 1855, 773.—Schinz, Synopsis Mam. I, 1844, 199.—Max Prince Wied, Archiv Naturg. 1861, 188.

Lasiurus noveboracensis, Tomes, Proc. Zool. Soc. 1857, 34.

Vespertilio lasiurus, Gmel. Syst. Nat. 1788.—Schreb. Säug. 1826.—Geoff. Ann. du Mus. VIII, 1806, 200, f. 6.—Desm. Mam. 1820, 142.—Fisch. Synop. Mam. 1829, 109.

Nycticejus lasiurus, Wagner, Schreb. Säug. Suppl. V, 1855, 772.

Vespertilio rubellus, Palisot de Beauvois, Cat. Peale's Mus. 1796.

Vespertilio villosissimus, Geoff. Ann. du Mus. VIII, 1806, 478.—Desm. Mam. 1830, 143.—Fisch. Syn. Mam. 1829, 110.—Rengg. Säugt. von Parag. 1830, 83.—Wagner, Supp. Schreb. Säug. I, 1840, 536.

Vespertilio monachus, Raf. Am. Month. Mag. IV, 1817, 445.

Vespertilio tessalatus, Ib.

Taphyzous rufus, Harlan, Fauna Americana, 1825, 23.

Vespertilio rufus, Warden, Descript. United States, V, 602. (?)

Lasiurus rufus, Gray, List. Mam. Brit. Mus. 1843, 32.—Gosse, Naturalist in Jamaica, 1851, 280.

Vespertilio blossevillii, Less. et Garn. Bull. des Sci. Nat. VIII, 95.—Fisch. Synop. Mam. 1829, 110.—La Sagra, Hist. de l'Ile de Cuba, 1840, 6, pl. i, f. 4, 5, 6, 7, 8.

Vespertilio bonariensis, Less. Voy. de la Coquille, 1829.

Nycticejus varius, Poepp. Reise Chili, I, 1835, 451.—Wagner, Suppl. Schreb. Säugt. I, 1840, 547.—Gay, Hist. de Chili, (Zool.) I, 1848, 37.

New York Bat, Penn. Syn. Quad., 1771, 367.—Penn. Arct. Zool. 1792, 184.—Kirtland, Zöol. Report, 175.—Emmons, Mass. Report, 1840, 9.

Red Bat, Wilson Ornith. VI, 50, f. 4.

Habitat.—Universally distributed throughout the temperate regions of North America; moderately abundant.

Description.—Head and face hairy; nose blunt, rounded, slightly emarginated; nostrils opening semi-laterally. The sides of the face slightly inflated and set with small stiff hairs. A similar row of longer hair surrounds the eyes. The upper lip, especially at the sides of the face, is more massive than the lower, and is somewhat produced. The ears are subrounded;—the inner border straight until near the tip where it suddenly turns outwards;—at its base is a well developed lobe which lies close to, but slightly behind the tragus. The outer border is slightly convex, and terminates at the angle of the mouth. On a line with the outer border of the ear a sharply defined lobe is noticed, which at first appears to be the termination of the border, but upon close examination it is found to continue on to the angle of the mouth. Between this lobe and the mouth there is placed

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a small wart which is covered with setæ. The tragus is half the height of the ear, is straight on the inner edge, except at the point, where it turns abruptly inwards. The outer border has a very irregular outline. The basal portion is indentated. This indentation, which, in comparison to other species of *Vespertilionidæ* is considerable, is of itself not very deep, and ends in the most convex point of the tragus, whence the border runs upward and inward to the tip. The lower jaw is covered with short hairs, and has at its symphysis a small naked space which is gradually lost along the sides of the mouth. The posterior surface of the ear is covered with hair one-half its length, which extends upon the anterior production of the external border down to the angle of the mouth.

The fur of the body is everywhere long and silky. Anteriorly it is rather denser though not quite so long as that posteriorly. It is of a light russet red, tinged with yellow—being tipped with gray toward the neck, and verging to a fawn color, in some specimens, towards the pubis. Fur of the same general hue extends from the body upon the alar membranes up to the base of the third finger of either side and blends with that upon the anterior surface of the interfemoral membrane at about the region of the tibio-femoral articulation. The hair upon the latter membrane runs down fully one-half its length in most specimens. The interbrachial expansion also possesses a sparse growth of yellowish fur. Posteriorly the fur is very long and presents a richer appearance than anteriorly. The russet red color is here predominant in the majority of individuals, though we meet with a great variety of hues of fawn, fawn-red, and yellowish cinereous. At each shoulder a conspicuous white tuft of hair is seen; this is not elevated above the surrounding fur of the neck with which its whitish color gradually blends.

The posterior surface of the alar membranes is less extensively furred along the brachial and digital regions than the anterior surface, being here almost altogether confined to longitudinal bands extending from the neck downwards across the interbrachial membrane midway from the shoulder to the elbow, and thence continuing along the sides of the body and external border of the tibia to the ankle and tarsus of either side. The dorsum of the fifth finger, for about one-third of its length, is covered with fine scattering hair, which in some individuals is not confined thereto

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but extends between the fourth and fifth fingers. The basal joint of the thumb is decorated with a whitish tuft. The posterior surface of the interfemoral is very thickly covered over its whole area with fur of the same color as that of the body.

The difference in hue of the various individuals is chiefly owing to the coloration of the tips of the hair. Each hair is tinged as follows:—

The base dark plumbeous in color, verging to black; the centre, a delicate yellowish-brown, passing onwards toward the tip to a darkish red, in some instances to a brighter red, more rarely to a beautiful chocolate. The point is generally white. The grayish chocolate and dark red varieties are the principal ones seen in the northern specimens, while the bright red prevails among those of warmer sections of the country.

The hair covering the interfemoral membrane before and behind is indistinctly bi-colored; the irregular growths scattered elsewhere upon the alar membranes are unicolored.

The color of the membranes is a rich brown, bordering on a yellowish-brown, about the head. The ears and lips are marked with yellow in the same manner as in the next species (*L. cinereus*) they are marked with black.

Fig. 15.

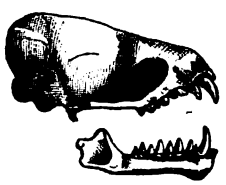

Fig. 16.

Skull small; occiput high; cranium broad.

Dentition.

Molars $\frac{5}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{5}$ = 32 teeth.

Upper Jaw.—Incisors small, strongly convergent; canines simple. First premolar very minute, entirely hidden from view externally by the close position of the second premolar to the canine; molars not peculiar except the last, which is small and thin, compressed from before backwards.

Lower Jaw.—Incisors crowded; canines pointing backwards.

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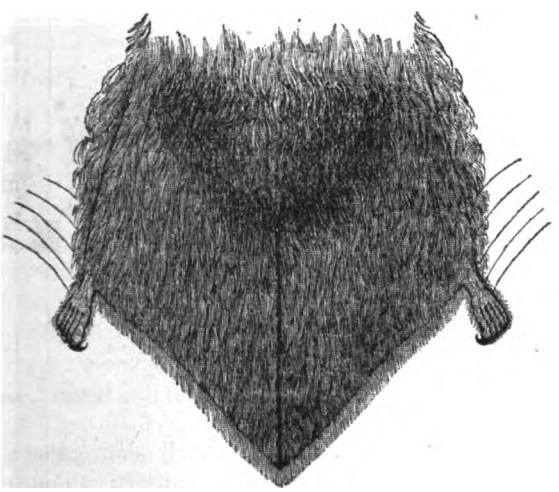
First and second premolars distinct; first smaller than second, which leans toward the canine, and its axis, if produced, would touch it. Other molars as usual.

I regret that my material will not allow me to decide the interesting question whether this species really occurs in South America. My most southern specimens come from the Rio Grande, Texas, and Cape St. Lucas—no difference being observed between them and the more northern individuals.

Dr. J. E. Gray (Zool. Proc., 1862, 143) gives a notice of a Lasiurian bat from the Sandwich Islands which he asserts to be the *L. Grayii*, Tomes. This fact is of interest, since it proves that the same species may have a distribution from the Sandwich Islands to Chili, where Mr. Tomes' specimen was collected.

According to Dr. Gray, *loc. cit.*, there is a specimen labelled *L. Grayii*, Tomes, in the British Museum, from Nisqually, Straits of Juan de Fuca. I have, however, never met with any bat in North America answering to Mr. Tomes' description.

Fig. 17.



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MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5266	..	1.9	2.0	1.6	0.9	3.3	0.4½	0.4	0 2	10.9	
5267	..	1.9	2.0	1.6	0.9	3 5	0.4½	0.6	0.3	12.0	
67	..	2.0	1.9	1.6	0.9	3 0	0.4	0.5	0.3	11.6	
..	..	2.0	1.9	1.6	0.9	3.5	0.4½	0.4	0 3	12.0	
..	..	2 0	1.9	1.5	0.9	2.9	0.4	0.5	0.3	11.0	
..	..	2.0	1.9	1.6	0.9	3.0	0.4½	0.4	0.3	11.0	

LIST OF SPECIMENS.

Cat. No.	Specimens.	Locality.	Presented by	Nature of Spec'n.
5242	1	Muskeeget Isl., Mass.	Dr. T. M. Brewer.	In alcohol.
5243	2	Wethersfield, Conn.	Charles Wright.	"
5245	2	Mt. Holly, N. J.	Dr. Brown.	"
6188–90	3	Carlisle, Pa.	S. F. Baird.	"
5244	17	Carlisle, Pa.	S. F. Baird.	"
5540	2	Ann Arundel Co., Md.	J. H. Clark.	"
5247–8	2	Washington, D. C.	National Institute.	"
5246	1	Washington, D. C.	Dr. Nichols.	"
5257	3	Columbus, Ga.	Dr. Gesner.	"
5256	5	Liberty Co., Ga.	Dr. W. L. Jones.	"
5263	1	Tallahassee, Fla.	T. Glover.	"
5314	1	Micanopy, Fla.	Dr. J. B. Bean.	"
5260	2	Eutaw, Ala.	Prof. Winchell.	"
5259	1	Washington, Miss.	Col. B. L. C. Wailes.	"
5252	1	Washington. Miss.	Col. B. L. C. Wailes.	"
5253	1	Monticello, Miss.	Miss H. Teunison.	"
5464	1	Columbus, Miss.	Dr. Spillman.	Dry skin.
5261	2	Tyree Springs, Tenn.	Prof. R. Owen.	In alcohol.
5262	2	Knoxville, Tenn.	Prof. Mitchell.	"
5274	1	Grand Coteau, La.	St. Charles College.	"
5270	1	Prairie Mer Rouge, La.	James Fairie. [U.S.A.	"
5253	1	Ft. Towson, Ark.	Dr. L. A. Edwards,	"
5254	2	Ft. Smith, Ark.	Dr. G. C. Shumard.	"
5256	3	Red River, Ark. ?	?	"
5251	1	Cass Co., Mo.	Dr. P. R Hoy.	"
5463	1	Missouri.	Dr. P. R. Hoy.	Dry skin.
5250	14	St. Louis. Mo.	Dr. G. Engelmann.	In alcohol.
4215	1	Neosho Falls, Kansas.	B. F. Goss.	Dry skin.
5249	6	Illinois.	R. Kennicott.	"
5460	1	Cook Co., Ill.	R. Kennicott.	"
5457	1	Racine, Wis.	Dr. P. R. Hoy.	"
5459	1	Albion, Mich.	R. R. Child.	"
5456	1	Grosse Isl., Mich.	Rev. Charles Fox.	"
5466	1	Lake Superior.	?	"
5458	1	Yellow Stone River.	Dr. F. V. Hayden.	"
5461	1	Yellow Stone River.	Col. Vaughan.	In alcohol.
5265	1	Nebraska.	Dr. J. G. Cooper.	"
5264	1	Laramie Peak, Neb.	Dr. Hayden.	"
5278	1	Cimarron River, Kans.	J. H. Clark.	"
5269	1	Pecos River, Tex.	Capt. J. Pope.	"
5272	3	Bet. Laredo & Camargo,	Arthur Schott.	"
5277	5	Matamoras. [Tex.	Lt. Couch. (Berl. Col.)	"
5268	1	Fort Bliss, N. Mex.	Do. S. W. Crawford.	"
5286	1	Fort Tejon, Cal.	John Xantus.	"
5267	1	Cape St. Lucas.	John Xantus.	"
5273	1	Rock Creek?	W. S. Wood.	"
5279	1	Locality unknown.	?	"
5275	1	" "	?	"
6183–7	3	" "	?	"
5271	1	" "	?	"
5541	1	" "	W. L. Le Duc.	"

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Lasiurus cinereus, Allen.

The Hoary Bat.

Fig. 18.

Fig. 19.

Vespertilio cinereus, Palisot de Beauvois, Cat. Peale's Mus. Phila. 1796, 14.—Leconte, Proc. Phila. Acad. Nat. Sci. 1855, 433.

Vespertilio pruinosus, Say, Long's Exp. to Rky. Mts. 1823, 67.—Harlan, Fauna Amer. 1825, 21.—Ib., Med. and Phys. Researches, 1831, 28.—Godman, Amer. Nat. Hist. 1826, 68, pl. ii, f. 3.—Richardson, Fauna Bor. Amer. 1829, 1.—Cooper, Ann. Lyc. N. York, IV, 1837, 54.—DeKay, Nat. Hist. N. York (Zool.), 1842, 7, pl. ii, f. 2.

Scotophilus pruinosus, Gray, Mag. Zool. and Bot. II, 1838, 498.

Nycticejus pruinosus, Temm. Monog. Mam. 1835, 154.—Wagner's Schreb. Säug. (Suppl.) I, 1840, 544.—Ib. V, 1855, 770.—Schinz, Syn. Mam. I, 1845, 197.—Max Pr. Wied, Archiv Naturg. 1861, 185.

Lasiurus pruinosus, Tomes, Proc. Zool. Soc. Lond. 1857, 37.

Description.—Head large, flat and hairy. Sides of the face somewhat inflated, the tips slightly whiskered. Nostrils wide apart, snout rather high, emarginated. Lower lip with smooth, naked space anteriorly. Ears broad as high, of a roundish form with large internal lobe, which lies close to the head and nearly covering the eyes and approaching closely the external inferior lobe. The internal border is markedly convex: in some specimens slightly emarginate at its tip—the external border being thinner than the internal, less convex and somewhat irregular in outline. The basal external lobe is very conspicuous and abrupt, with obtuse summit, and terminates on a line with the posterior angle of the eye. The tragus is broad, inner border straight; tip blunt, curved inwards; external border longer than internal, convex, upper two thirds convex the lower. The ears are black on the borders, rather extensively haired without, to a less extent within—the extreme border being naked. The tragus is slightly haired in front.

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The fur is everywhere soft and thick; anteriorly less thick than posteriorly, and tinged as follows: neck, beneath the ears and lower jaw, of a faded yellow color; the breast of a dark fawn, tipped conspicuously with white—a mixture of these two colors, producing a dirty cinereous tinge towards the axillæ. The abdomen is of a more uniform color, the fawn hue predominating over the cinereous. Posteriorly the fur is longer, more luxuriant and variegated. The head and posterior surface of the ears are of the same yellowish hue as the anterior portion of neck. Below these points the hair is everywhere of a rich brownish chocolate, or umber smoky fawn color, tipped with white. This contrast of color gives the animal a very brilliant appearance, and has suggested for it the name of "hoary bat," by which it is generally known.

The fur upon the membranes has a distribution similar to that in *L. noveboracensis*. Anteriorly it extends in a wide band to the third finger upon the interbrachial membrane, and covers in one-third of the surface of the interfemoral membrane. Posteriorly this membrane, together with the dorsum of the foot, is entirely haired. The fur has not generally an extensive distribution upon the wing membranes, though in not a few individuals I have found this tendency marked. A small patch of fur is seen at the base of the thumb and fifth finger.

Each hair upon the body has four colors, with the exception of the regions about the head and belly where it has but two. The coloration is as follows: Base plumbeous black; next to this a dingy yellowish-brown; sub-tip is of the same hue as base; the tip being pure white.

The proportion of the basal color and the white tip is constant, but the other shades are variable. Thus upon the back of the neck is the light yellowish shade above mentioned, while the proportion of the plumbeous is scarcely noticeable. But the latter color gradually increases while the former decreases as the fur extends downwards until upon the loins the preponderance of the darker shade with an intermingling of umber brown is very marked. Upon the interfemoral membrane, posteriorly, the fur partakes of the same hue, tipped with grayish-white; that anteriorly has a fawn colored base with lighter tips.

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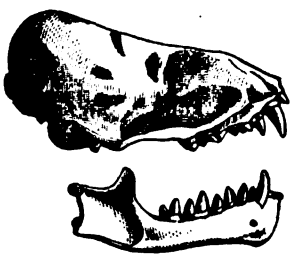
The shoulder tuft is inconspicuous; on the membrane above the elbow there is a small whitish spot of hair.

Membranes very ample. Thumb large. Foot moderate.

Fig. 20.



L. cinereus.

Skull.—Broad and high. Palate sloped considerably backwards.

Dentition.

Molars $\frac{5}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{5}$=32 teeth.

Upper Jaw.—Incisors stout, short, wide apart. Canines large and simple. First premolar very minute, wedged in between the canine and second premolar, which is large and pointed. Last molar compressed antero-posteriorly.

Lower Jaw.—Incisors bifid, but not much crowded. Canines with a small anterior cusp. Molars as usual, first smaller than second, which is not inclined so much anteriorly as in the preceeding species.

This species, since the date of Mr. Say's description, has generally been known as *V. pruinosus*, until Major Leconte claimed for M. Palisot de Beauvois the priority of the name *V. cinereus*, as described by him in the Catalogue of Peale's Mus., Phila., as early as 1796. This very rare pamphlet had evidently been overlooked by Mr. Say, and having been so fortunate as to find a copy in the library of the Phila. Academy I have no doubt that the description of Palisot de Beauvois is intended to apply to the species now under consideration.[1]

[1] See Appendix.

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Dr. J. E. Gray, in Cat. of Mammalia, 1862, 49, has given Bolivia, S. A., as a locality for *L. cinereus*, but with perhaps insufficient authority.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5280	..	3.0	2.4	2.0	1.0	4.3	0.6	0.6	0.4	15.3	
14 (?)	..	3.0	2.5	2.2	1.0	4.1	0.7	0.6½	0.4	14.9	
147	..	2.6	1.8	2.0	0.11	4.0	0.6	0.4	0.3	13.4	
3255	..			2.0	1.0	4.1	0.6	0.4	0.3	12.6	
40	..	3.0	2.0	2.0	0.10	4.2	0.6	0.4	0.4	13.6	
4213	..	2.6	2.0	2.0	0.10	4.2	0.6			13.6	
4723	..			2.0	0.8	3.9	0.7	0.3½	0.3	11.6	
269	..	2.0	2.0	2.0	0.11	4.0	0.6	0.3	0.2½	12.6	
3098	..	2.0		2.0	0.10	4.0	0.7	0.4	0.2½		
1743	..	2.0	2.0	2.0	0.10	3.8	0.6	0.4	0.3	10.0	
73	..	2.6	2.0	2.0	0.12	4.0	0.6	0.4	0.3	12.0	
93	..	3.0		2.0	0.11	4.0	0.6		0.4	11.6	
873	..	2.6	2.0	2.0	0.11	4.0	0.6	0.4	0.3	12.6	
883	..	2.6	2.0	2.0	0.12	4.1	0.6	0.4	0.3	14.0	
415	..	2.6	2.0	2.0	0.10	4.0	0.6	0.4	0.3	14.0	

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5280	1	Halifax, N. S.	Dr. Gilpin.	Alcoholic.
6184	1	British America.	R. Kennicott.	"
5286	1	Red River settlem.	D. Gunn.	"
5417	1	Cleveland, O.	Dr. Kirtland.	Dry.
5421	1	Little Blue, Kansas.	W. S. Wood.	"
5281	2	St. Louis. Mo.	Dr. G. Engelmann.	Alcoholic.
5283	1	Grand Coteau, La.	St. Charles College.	"
5328	2	Ft. Pierre. Neb.	D. J. Evans.	"
5284	2	Near Ft. Union, Neb.	Dr. Hayden.	"
5422	1	Ft. Pierre, Neb.	" "	Dry.
4213	1	Neosho Falls, Kans.	B. F. Goss.	"
5415	1	South Fork Platte.	F. V. Hayden, M. D.	"
3768	1	La Boule River, Utah.	? [U. S. A. (?)	"
5414	1	Donana, N. M.	Dr. T. C. Henry,	"
5282	5	Matamoras.	Lt. Couch, Berl. Coll.	Alcoholic.
4728	1	"U. S."		Dry.
5286	2	Monterey, Cal.	A. S. Taylor.	Alcoholic.
5287	1	Petaluma, Cal.	E. Samuels.	"

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Lasiurus intermedius, ALLEN.

Fig. 21.

Fig. 22.

L. intermedius, ALLEN, Proc. Phila. Acad. Nat. Sciences, 1862, 146.

Description.—Head large, flat, hairy. Snout high, emarginate, and of a brown color. Nostrils opening sublaterally. Sides of face moderately inflated. Mouth and lower jaw fringed slightly with short hair. Small naked space at mentum. Ears high, elliptical, pointed, and nearly naked—strongly convex on their inner border, nearly straight on their outer—the lobe at the base of the outer border well developed. The tragus similar in shape to that of *L. cinereus*, but has a blunter incurved tip; it is slightly haired on facial surface. Eyes diminutive, placed near the ear. Thumb rather small. Feet moderate.

Fur not so extensive as in other species of the genus, posteriorly extending upon the wing membrane from body, as in *L. cinereus*—running down the interfemoral membrane but two-thirds the distance and on to the foot; a very small brownish tuft is seen at base of thumb, and on the membrane at and above the elbow, while the fourth and fifth fingers are naked. Anteriorly the hair spreads up under the arm to wrist as in other species, but less thickly. It also runs down a little way upon the interfemoral, and is observable upon the interbrachial membrane. The wing membrane extends to base of toes. The calcaneum is moderately developed.

General hue olive brown. Hairs blackish at base, dirty brown at centre, with a clearer tip. The color is somewhat darker behind than in front.

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Dentition.

Molars $\frac{4}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{6}$. Canines $\frac{1}{1}$. Molars $\frac{4}{5}$ = 30 teeth.

The small premolar placed behind the canine of the upper jaw of *L. cinereus* and *L. noveboracensis* is here absent.

This species in size, physiognomy, number of incisors, and character of the distribution of the fur resembles the type of *Lasiurus*, while in shape of the ears and disposition of molars it is akin to *Scotophilus*. The interfemoral membrane is scarcely more hairy than in *S. noctivagans*, yet the entire contour of the animal is strongly Lasiurian. It is intermediate between *L. grayi*, Tomes, and *L. cinereus*, Pal. de Beauvois. It is larger than *L. grayi*, and smaller than the majority of specimens of *L. cinereus;* the thumb is small as in the former, but the wing membrane extends to the base of toes as in the latter; it is distinct from both in the brown fur, in the high ear and the scantiness of the hair on the interfemoral membrane.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
3328	..	3.0	2.6	2.2	0.11	4.0	0.5	0.7½	0.3	13.0	Alcoholic.
6135	..	2.3	2.2	2.1	0.11	4.0	0.4½	0.7	0.2½	13.6	"
6136	..	2.9	2.7	2.1	0.11	4.1	0.4½	0.6½	0.3	15.9	"
6137	..	2.6	2.2	2.1	0.11	4.1	0.5	0.6½	0.3	13.3	"
6139	..	2.6	2.0	1.9	0.8	3.6	0.5	0.7	0.3	12.0	"
6140	..	2.5	2.0	2.0	0.11	4.0	0.3	0.7½	0.3	12.6	"
	..	2.5	2.0	2.0	0.9	2.6	0.5	0.6	0.3	13.0	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'n.
3328	1	Matamoras, Mex.	Lt. Couch, U.S.A. (Berl. Coll.)	Alcoholic.
6135	1	"	" " "	"
6136	1	"	" " "	"
6137	1	"	" " "	"
6138	1	"	" " "	"
6139	1	"	" " "	"
6140	1	"	" " "	"

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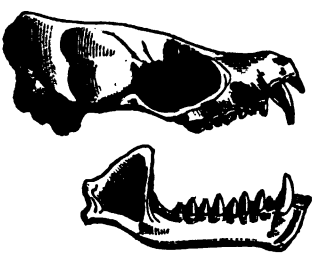
SCOTOPHILUS, Leach.

Scotophilus, Leach, Trans. Linn. Soc. Lond. XIII, 1822, 71. (Type *S. kuhlii*.)
Vesperus, Keyserling & Blasius, Wirbel-Thiere Europas, 1840, 49.
Vesperugo, Keyserling & Blasius, Wirbel-Thiere Europas, 1840, 45.

Molars less than $\frac{6}{6}$; head flat, broad; lips swollen; tragus bluntish; internal basal lobe of ear rounded, obtuse.

Fig. 23.



Scotophilus carolinensis.

The genus *Scotophilus* is closely allied to *Vespertilio* and differs chiefly from it in the heaviness of its wing membranes, and in the thick leathery ear and tragus, which possess a tendency to develop in width rather than in height. The distinction between these genera is really difficult to describe, though readily recognizable upon observation. The difference between their facial expression might be compared to that between a mastiff and terrier dog: the former is massive with broad head, pendulous lips and wide ears; the latter is more slender, with a narrower face and delicate and upright ears.

The type of the genus *Scotophilus* of Leach is his *S. kuhlii*, described without reference to any previous author, and without indication of habitat. It is impossible to say, therefore, whether he refers to the *Vespertilio kuhlii* of Natterer (1819), a European species, or whether he applied the name to a second and different species. As however the diagnosis appears not incongruous with the European *kuhlii*, and as this was probably known to him at the time, we may adopt the former supposition. This species falls in the genus *Vesperugo* of Keyserling & Blasius.

It is not a little remarkable that the paper of Leach, in which

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the genus *Scotophilus* is described, should have apparently escaped the attention of Continental authors; to such a degree, indeed, that they credit the genus to Gray as of 1842,[1] and consequently subsequent to *Vesperugo* of Keyserling & Blasius, instead of being long prior to it. I have found no reference in any of the standard European authors to the species *Scotophilus kuhlii* of Leach, except by Tomes, as in Pr. Zool. Soc., 1861, 35, etc.

The following is the arrangement of the species:—

a. (VESPERUS, Keys. & Blasius.) Central incisors larger than lateral; upper molars 4; base of foot with rounded swelling—

Ears sub-erect	*S. carolinensis.*
Ears turned outwards	*S. fuscus.*

b. (VESPERUGO, Keys. & Blasius.) Central incisors equal to the lateral; upper molars 5; base of foot without rounded swelling—

Central incisor bicuspid	Tragus slender, erect	*S. georgianus.*
	Tragus thick, obtuse	*S. noctivagans.*
Central incisor unicuspid		*S. hesperus.*

Scotophilus carolinensis, GEOFF.

The Carolina Bat.

Fig. 24.

Fig. 25.

Vespertilio carolinensis, GEOFF. ST. HILAIRE, Ann. du Mus. VIII, 1806, 193, pl. xlvii, f. 7.—HARLAN, Fauna Amer. 1825, 9.—GODMAN, Amer. Nat. Hist. 1826, 67.—LECONTE, Cuv. An. King. (McMurtrie) I, 1831, 431. —HARLAN, Month. Amer. Jour. Geol. and Nat. Sc. I, 1831, 218.—IB., Med. and Phy. Research. 1831, 28.—COOPER, Ann. Lyceum N. H., N. Y.

[1] Ann. and Mag. N. H., X, 1842, 257.

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IV, 1837, 60.—DeKay, Nat. Hist. N. Y. (Zool.), 1842, 10, pl. ii, f. 1.—Desm. Mam. 1820, 136.—Temminck, Monog. II, 1835, 237.—Leconte, Proc. Acad. Nat. Sci., 1855, 434.—Wagner, Schreb. Säug. V, 1855, 753.

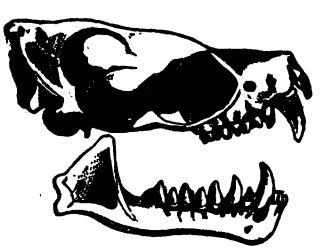
Description.—Head flat; nostrils emarginated; ear not quite as long as the head, broad at base, obtusely rounded at tip; tragus straight on the inner side, slightly convex on the outer, nearly half the height of the auricle and notched at the outer lower part. The inferior anterior part does not reach the angle of the mouth. Nostrils rather large, separated by an emarginate space. Tip of tail exserted.

Hair uniformly bicolored, except on the ears and margins of the body; on the back it is dark plumbeous at base, the upper half varying from dusky cinereous to dark brown. On the head the hair is more lanuginous and thickly set; it covers half the posterior part of the ears, and runs on almost to the nose; in the latter portion it is longer, and bicolored, as in the back.

Fur on the under surface lighter than on the upper. A light brown tinge tips each hair—the lower two-thirds being dark cinereous, verging to black. As the hair in front approaches the head it also becomes woolly like that on the back, and has a tendency to assume one color. This appearance terminates at the anterior inferior border of the ear.

Interfemoral membrane ample; basal fifth furred posteriorly, faintly dotted with minute tufts of hair elsewhere. Terminal joint of tail exserted. Wing membrane attached to base of toes. In many specimens the calcaneum is well developed.

Fig. 26.



Scotophilus carolinensis. (Magnified.)

Skull.—The skull is large, and slightly crested behind.

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Dentition.

Molars $\frac{4}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{4}{5}$ = 32 teeth.

Upper Jaw.—The central incisors are large, converging, irregularly bifid—the internal cusp being the longer; the laterals not more than one-third the length of the centrals. Canines unicuspid, with minute basal cusps. First molar narrower than the other three, answering to the third premolar of *Vespertilio*.

Lower Jaw.—Incisors 6, trifid, crowded. Canines large, simple. Molars 5, the first two smaller and simple, increasing in size from the canines. Molars proper not peculiar.

I feel some hesitation in separating *S. carolinensis* from *S. fuscus*. They may yet prove to be the same, in which case *S. carolinensis* must be considered a synonym of *S. fuscus*.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
1	..	2.2	1 8	1.8	0.7	3.0	0.4	0.6	0.2	12.0	Dry.
4214	..	2.6	1.6	1 9	0.7	3.0	0.4	0.6	0.3	10.0	"
4732	..	2.3	1.6	1.9	0 7	3.0	0.4	0.7	0.3	10.0	"
75	..	2.5	1.7	1.9	0.7	3.0	0.4	0.7	0.3	?	"
5135	..	2.4	1.6	1.8	0 7	3.0	0.4	0.6	0.3	?	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5521	1	Carlisle, Pa.	S. F. Baird.	Dry.
5135	1	Washington, D. C.	" "	"
4214	1	Neosho Falls.	B. F. Goss.	"
5543	5	Nebraska.	Dr. Cooper.	Alcoholic.
4732	1	"U. S."	Maj. Leconte.	Dry.
5542	1	?	C. Girard.	Alcoholic.

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Scotophilus fuscus, PALISOT DE BEAUVOIS.

The Brown Bat.

Fig. 27.

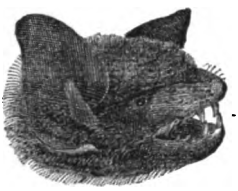

Fig. 28.

Vespertilio fuscus, PALISOT DE BEAUV. Cat. Peale's Mus. 1796, 14.—LECONTE, Proc. Acad. Nat. Sci. Phila. 1855, 437.

Vespertilio arcuatus, SAY, Long's Exp. R'ky Mts. 1823, 167.

Vespertilio phaiops, RAF. Amer. Month. Mag. 1818, 445 (not TEMM. Monog. Mam. II, 1835, 234).—LECONTE, Proc. Acad. Nat. Sci. Phila. 1855, 437.—WAGNER, Schreb. Säug. V, 1855, 756.

Vespertilio ursinus, TEMM. Monog. Mam. II, 1835, 234.—WAGNER, Schreb. Saüg. V, 1855, 756.—MAX PR. WIED, Archiv Naturg. 1861, 190.

Vespertilio gryphus, FR. CUV., Ann. du Mus. I, 1837, 15.—WAGNER, Schreb. Säug. V. 1855, 749.

Vespertilio caroli, LECONTE (not TEMM.), Proc. Acad. Nat. Sci. Phila. 1855, 437.

Scotophilus greeni (?) GRAY, Cat. Mam. British Museum, 1842.

Description.—Ears moderate, leathery, semi-erect, turned slightly outwards, convex on the inner border, nearly straight on the outer, in some slightly emarginate; the lower third of this portion is slightly revolute outwards; basal lobe well developed. Tragus nearly half as high as auricle, straight on inner border, moderately convex and diverging on outer; sometimes the tip is more acute than in other species, but is never pointed; in some specimens it has a very slight incurvation.

The coloring is very similar to *S. carolinensis*, being dark plumbeous at base, with chestnut-brown tips above, and light cinereous, fawn russet brownish tips below. This coloration exhibits some slight differences in different specimens: thus the back may be more of a light russet, and that in front more of a whitish hue. The extent of the plumbeous is also subject to variation, in some specimens occupying but the lower third of the hair; while in others—and this is more apt to occur on the front—

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the tips only will be of a different color. The fur is soft and long, running up the back of the ears one-half their height in many specimens, in others not more than a third that distance. The basal part of the triangular interfemoral membrane behind is hairy, the rest naked. Calcaneum weak. No extension of the fur upon the wing membrane. Thumb and foot moderate. Back of foot very slightly haired.

These variations in the coloration of this species enable the observer to arrange the specimens into three groups according to the style of coloring of the fur. Thus the 1st group has chestnut-brown tips on the back, with grayish-white tips on the belly; 2d, olive-brown tips on back, with fawn russet tips on the belly, intermingled with whitish; and 3d, deep chestnut-brown both above and below, that of the front being but a shade lighter than that of the back. In the specimen, No. 5966, Williamstown, Mass., the tips of the fur is everywhere white at the tip.

Both *S. carolinensis* and *fuscus* resemble *S. serotinus* of Europe. The shape of the ear and tragus are very similar, and the character of the face and tumidity of lips the same in all. The latter species, however, is of a larger size than the others, and the fur is almost entirely unicolored—that is, there being little or no difference between the coloration of the base and the tip of each hair.

Dentition, similar to that of preceding species.

Major Leconte, in his "Observations on the Bats of North America," claims the specific name *fuscus*, for what was formerly known as the *V. arcuatus*, Say. In my attempt to include several supposed distinct forms under one head, I have chosen the same name.

Palisot de Beauvois, as early as 1796, describes a species—*V. fuscus*—in an old pamphlet catalogue, which, being but little known, had received no attention prior to Major Leconte's quotation. The description in this forgotten brochure does not correspond very well with that of *Scotophilus:* for the number of incisors in the upper jaw is less than the number actually present. But this objection has not the importance that at first sight it might appear to possess, inasmuch as the little incisor, situated close to the canine, very frequently escapes observation—it being almost completely hidden in the growth of the adjacent

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gum. This slight omission I think in nowise affects the diagnosis, any more than the fact that the neglect of naturalists for a long time to notice the minute premolar behind the canine of the upper jaw of *L. cinereus* and *noveboracensis* would affect the identity of those species.

Temminck's species, *V. ursinus* and the *V. phaiops* of Rafinesque, I consider to be the same as the one under consideration. It would appear strange that these two forms should be united, when the bicolored hair of the first, as described by Temminck, would at once separate it from the unicolored fur of the second.[1] Major Leconte has indeed separated them; but in the individuals labelled by him, now before me, I have not been successful in observing any such difference as those mentioned above. I have, therefore, taken *V. ursinus* to be a true synonym of *S. fuscus*, and the form mentioned by Temminck as the *V. phaiops*, Raf., to be a species that has not been observed in North America, and is probably a member of another fauna.

In the memoir above noticed, Major Leconte has made a laudable effort to identify the species, the result of the labors of European authors, and thus relieve this subject of its intricate synonomy. With this object in view, he has dwelt upon and developed points not mentioned by the original describers. Thus, in speaking of the shape of the outer border of the ear, he says:—

"The *fuscus* has the ear somewhat triangular, very concave on the outer edge, and emarginate near the tip.

"The *ursinus* ear oval, entire; that is to say not at all emarginate, the orillon acinaciform and obtuse.

"The *phaiops* ear somewhat triangular, sinuous or bi-emarginate on the outer edge, orillon oblong, blunt.

"The *caroli* has the ears ovate, emarginate behind almost from the tip to the base, and the orillon lanceolate, blunt, rounded at the point, a little curved on the posterior edge."

While acknowledging that these differences may exist, I do not consider them to be constant. In a species so extensively distributed—and in a family so well known for its Protean tendencies—as that to which *S. fuscus* belongs, slight and variable changes, confined entirely to the parts of the ear, are hardly sufficient data for these separations.

[1] *Vide* Appendix.

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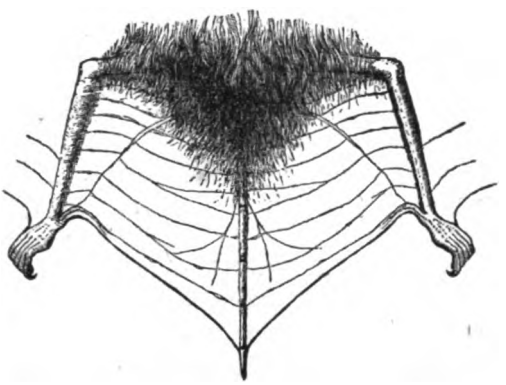
Had Major Leconte been an original laborer in this field, and the material now before me been at his disposal, I can scarcely believe that he would have described from it four new species of bats. He would rather have looked upon the minute differences above mentioned as of no specific value.

I may mention here that *V. caroli*, Temm., is not a species of *Scotophilus*—Major Leconte being in error respecting the dentition. The dentition, according to its describer, is

Molars $\frac{6}{6}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{6}{6}$ = 38 teeth.

It is very probably a true *Vespertilio*.

Fig. 29.



S. fuscus.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
4731	..	2.6	1.4	1.9	0.9	2.9	0.3	0.5	0.2½	10 0	Dry.
4734	..	2.9	1.5	1.9	0.9	3.0	0.5	0 6	0.3	11.0	"
4737	..	2.5	1.5	1.8	0.8	3.0	0.4	0.5	0.2½	10.0	"
4739	..	2.9	1.4	1.8	0.9	3.0	0.4	0 7	0.3	10. ½	"
473	..	2.6	1.4	1.6	0 7	3.0	0.4	0.5	0.3	?	"
?	..	2.7	1.5	1.7	0.8	3.0	0.4	0.5	0 3	11.0	"
3137	..	2.2	1.6	1.9	0.7	3.0	0.4	0.5	0.3	9.6	"
537	..	2.4	1.4	1.6	0.7	2.6	0.3	0.5	0.2½	?	"
424	..	3.0	1.4	2.9	0.8	3.0	0.4	0.6	0.3	10	"

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LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
6192	1	Lake Winnipeg.	R. Kennicott.	Alcoholic.
5396	2	Williamstown, Mass.	S. H. Scudder.	"
5302	1	Westport, N. Y.	S. F. Baird.	"
5304	1	Carlisle, Pa.	S. F. Baird.	"
5307	1	Washington, D. C.	Col. Weaver.	"
5384	1	Washington, D. C.	T. R. Peale.	"
5306	1	Cleveland, O.	Dr. Kirtland.	"
5390	1	Mississippi.	Col. Wailes.	"
5310	1	Roane Co., Tenn.	Prof. Mitchell.	"
5332	3	Grand Coteau, La.	St. Charles College.	"
5311	1	St. Louis, Mo.	Dr. Geo. Engelmann.	"
5324	1	Ft. Riley, Kansas.	Henry Brandt.	"
5328	7	Nebraska.	Dr. J. G. Cooper.	"
5315	1	Milk River, Neb.	Dr. Hayden.	"
5317	2	Ft. Pierre, Neb.	Dr. J. Evans.	"
5309	1	Fort Towson, Ark.	Dr. Edwards.	"
5308	1	Fort Smith, Ark.	Dr. Shumard.	"
3271	1	Mo. of Poteau River.	"	"
6191 var	1	Brazos River, Tex.	"	"
5320	1	Puget Sound, W. T.	?	"
5325	1	Carson Valley, Nev.	Capt. J. H. Simpson.	"
5326	1	San Francisco, Cal.	H. B. Mollhauson.	"
5514	1	Posa Creek, Cal.	Dr. Heermann.	"
4337	1	United States.	Major Leconte.	"
4731	1	" "	"	"
4739	1	" "	"	"
4734	1	" "	"	"
5330	1	" "	?	"
5344–5	2	" [Cruz, Mex.	?	"
5411	1	El Mirador, near Vera	Dr. C. Sartorius.	"

Scotophilus georgianus, ALLEN.

The Georgian Bat.

Fig. 30.

Fig. 31.

Vespertilio georgianus, FR. CUV. Ann. du Mus. 1832, 16.—LECONTE, Proc. Acad. Nat. Sci. Phila. 1855, 436.—WAGNER, Schreb. Säug. V, 1855, 750.

Vespertilio monticola, BACHMAN, Proc. Acad. Nat. Sci. 1841, 92.

Vespertilio crassus (?), FR. CUV. Ann. du Mus. 1832, 17.

Vespertilio salarii (?), FR. CUV. Ann. du Mus. 1832, 17.

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Description.—Head flat, but not so heavy and thick as in other species of *Scotophilus*, moderately hairy; sides of face swollen, and studded with hair. Nose flat, broad, naked; nostrils small, oblique, opening sublaterally. Sides of mouth very slightly whiskered. Ears nearly naked, subelliptical, slightly convex on the inner, nearly straight on the outer border, which terminates near the mouth in a wart. Parts about the head light brown. Tragus straight, blunt, moderately divergent on its outer side. Thumb and feet large.

Fur thick, long and soft. Color dark rufous brown on back, brighter rufous in front; base of fur before and behind dark plumbeous. The fur extends to upper third of posterior surface of interfemoral membrane: the anterior surface of which is decorated with numerous small tufts arranged transversely. The fur of body also extends a slight distance upon the anterior surface of the wing membrane. Wings reach to base of toes; point of tail slightly exserted. Calcaneum moderate—its termination forms no lobe with the interfemoral membrane.

No. 7002 (included in 5297), a young specimen, Carlisle, Pa., is a variety with dark, faintly bicolored fur, of a grizzled olive-brown color.

Fig. 32.

S. georgianus.

Skull small, papery; flat, but less so than in other species of *Scotophilus*. There is a slight tendency to the shape of face peculiar to *Vespertilio*.

Dentition.

Molars $\frac{5}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{5}$ = 34 teeth.

Upper Jaw.—The incisors placed as usual, and of the same size. The centrals of equal size and so obscurely bifid that the lateral point seems more like a basal cusp. The lateral teeth cuspid and converging (there are some examples of the bicuspid lateral). Canines rather small, simple. First molar minute, unicuspid,

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but readily visible from the outside. The second premolar resembles the corresponding tooth in the other species; the remaining molars are not peculiar.

Lower Jaw.—Incisors trifid, not crowded. Canines small, with a basal cusp on either side. The premolars are rather small, and have minute points at their base, making them appear as though indistinctly tricuspid. Other molars as usual.

This species has been but imperfectly described by the authors above cited. Fr. Cuvier's diagnosis is quite incomplete, and would be undistinguishable from that of the smaller form of *V. subulatus*, had it not been that, from having sent the author the specimens from which the description was taken, Major Leconte was familiar with the type and afterwards gave a more exact description of the animal in the work above cited. He however was himself in error in some particulars, especially in making the dentition similar to that of *V. subulatus*, and in asserting that the last false molar of the upper jaw was bi-emarginated. I have before me a large series of specimens, some of which have Major Leconte's name attached, but in none of them have I found any internal basal bi-emarginate cusp as described by him.

Dr. Bachman's description of *V. monticola* applies well to *S. georgianus*, excepting in the measurements, which, in the case of the ear and tragus, are entirely too small in proportion to the size of the body. I have an alcoholic specimen, marked *V. monticola*, in the same handwriting as some other specimens purported to have been labelled by Dr. Bachman, which is beyond doubt *S. georgianus*—the ear and tragus being of the usual size.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length o. tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5298	..	1.8	1.6	1.4	0.6	2.4	0 4	0.5	0.3	9.0	Alcoholic.
5297	..	1.6	1.6	1.4	0.6	2.4	0.4	0.5	0.3	8 9	"
5981	..	1.6	1.6	1.4	0.6	2 3	0.4	0.7	0.3½	8.6	"
5982	..	1.6	1.5	1.4	0.6	2.3	0.4	0.6	0.3	8.6	"
5983	..	1.6	1.5	1.4	0 7	2.2	0.4	0.5	0.3	8.6	"
5318	..	1.6	1.6	1.4	0.7	2.3	0.4	0.5	0.3	9.0	"
5339	..	1.8	1.6	1.3	0 6	2.3	0.4	0.4½	0.3	9.3	"
5340	..	1.6	1.5	1.4	0.6	2.2	0.3	0.5	0.3	9 3	"
	..	1.6	1.6	1.3	0.6	2.2	0.3½	0.5	0.3	8.11	"
5341	..	1.6	1.6	1.3	0.7	2.2	0.4½	0.5	0.3	8.10	"

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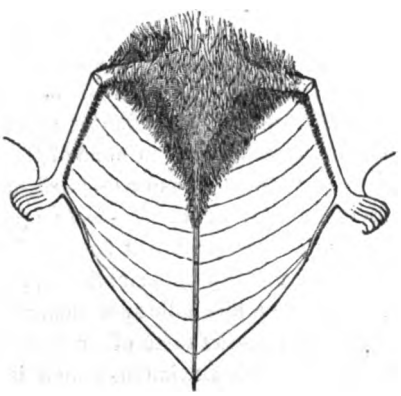
List of Specimens.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'n.
5297	36	Carlisle, Pa.	S. F. Baird.	In alcohol.
5433	1	"	" "	Dry skin.
5375	1	Washington.	?	In alcohol.
5298	1	"	C. Girard.	"
5440	1	Hampshire Co., Va.	M. M'Donald.	Dry skin.
5340	2	Clark Co., Va.	Dr. Kennerly.	In alcohol.
5339	1	Mount Vernon.	?	"
5341	1	Whitfield Co., Ga.	A. Gerhardt.	"
5442	1	Georgia.	W. Cooper.	Dry skin.
5343	1	New Orleans.	N. O. Acad.	In alcohol.
5401	1	St. Louis, Mo.	Dr. G. Engelmann.	"
5318	1	Cairo, Ill.	R. Kennicott.	"
5360	1	Poteau Creek, Ark.	Dr. G. C. Shumard.	"
5371	3	Matamoras, Mex.	Lt. Couch. (Berl. Col.)	"
5439	1	United States.	Major Leconte.	"

Fig. 33.



S. georgianus.

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Scotophilus noctivagans, LECONTE.

The Silvery-haired Bat.

Fig. 34.

Fig. 35.

Vespertilio noctivagans, LECONTE, Cuv. An. Kingdom (McMurtrie ed.), I, June, 1831, 31.—COOPER, Ann. Lyc. N. Y. IV, 1837, 59.—DEKAY, Nat. Hist. N. Y. (Zool.), 1842, 9, pl. i, f. 1.—WAGNER, Schreb. Säug. V, 1855, 754.

Vespertilio auduboni, HARLAN, Month. Amer. Jour. Geol. Nat. Hist. I, Nov. 1831, 220, pl. ii.—IB. Med. and Physical Researches, 1835, 30, pl. iv.

Vespertilio pulverulentus, TEMM. Monog. Mam. II, 1835, 235.—LECONTE, Proc. Acad. Nat. Sci. 1855, 436.—PR. WIED, Archiv Naturg. 1861, 192.

Description.—Head flat, broad, and moderately haired. Snout naked; nostrils wide apart, and opening sublaterally; space between emarginate. The sides of the face slightly swollen. The auricle is an irregular oval. The inner border ascends upwards and *inwards* to a level with the top of the head, and then turns upwards and *outwards*, ending in an obtuse point. The outer border is smooth, and terminates inferiorly and internally in a thin ridge near the angle of the mouth. The lower half of this border folds irregularly upon itself, and bends so markedly inwards as to touch the tragus. The tragus is straight internally, strongly and abruptly convex externally—at its base narrow. It is but one-third the height of auricle, and nearly as broad as high. Skin of face and ears blackish, with the exception of the internal basal lobe of the latter, which is whitish.

Fur long and silky, with a marked tendency to become black, and in many specimens the extreme tip of each hair is the only part possessing a different hue—it being a pale gray or white. The fur is thicker on the back than in front, but the coloration is very similar on both sides: if there is any difference, it is where the shaft of the hair in front assumes in some individuals a plumbeous brown hue instead of the blackish. The characteristic pulverulent dash to the fur presents a striking appearance, and

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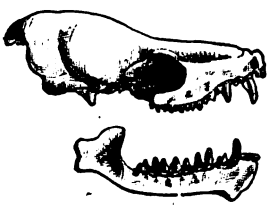
has given to this animal the popular appellation of the Silvery-haired Bat. The posterior part of the interfemoral membrane is thinly covered with short dark colored hairs: the anterior surface has upon it numerous minute tufts arranged linearly. Thumb small, slightly furred; foot moderate and furred on posterior surface.

Fig. 36.



S. noctivagans.

Skull flat, not crested; two shallow depressions anteriorly.

Dentition.

Molars $\frac{5}{6}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{6}$ = 36 teeth.

Upper Jaw.—Incisors two on either side of the median space, closely approximate to but not touching canines; nearly of the same length; centrals bifid, the teeth somewhat twisted on their axis so that the two cusps have something of an antero-posterior arrangement; the internal cusp is slightly longer than the external. The laterals are unicuspid, and have a basal cusp. The canines are simple and moderate. Of the five molars the first is very small, unicuspid, and crowded in between the canine and second premolar—it is visible from the outside. The second premolar has an external and internal cusp—the external longer than any external point of the molars proper, while the internal is shorter than any internal prominence. The other teeth as usual.

Lower Jaw.—Incisors not crowded, trifid. Canines moderate, with an anterior basal point. Of the three premolars the first is not so small as the second, which is about the size of the first premolar of the upper jaw; the third is about the height of the molars proper, and is simple. The other teeth as usual.

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This species was described by Major Leconte and Dr. Harlan in the same year; but the description by the latter gentleman appeared five months subsequent to the former. *Vide* Cooper, *loc. cit.* Temminck's account followed the original description five years; he obtained his specimens from the Prince Max. Wied. I cannot learn upon what ground Major Leconte, in his "Observations," employed Temminck's specific name and discarded his own. It no doubt had, so far as I can judge from given data, the undisputed priority.

S. noctivagans bears some resemblance to *S. discolor*, Kuhl, a European species. The shapes of ear and tragus, the color of membranes, the powdered fur, and the haired interfemoral membrane are common to both; but in *S. noctivagans* the color of the hair is blackish instead of brown, and the dentition is different in many particulars.

No. 5359 is smaller than the other specimens, and has a more subulate tragus. The specimen was imperfect.

Habitat.—From the Atlantic coast to Rocky Mountains.

Varies very little in color and size. I have never seen any specimens "entirely black," a peculiarity of coloring stated by Major Leconte to sometimes occur.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
3328	..	2.6	1.6	1.7	0.6	2.9	0.3	0.6	0 2	12.0	Dry.
4729	..	2.9	1.5	1.6	0.6	2.9	0.3	0.6	0.2½	12.0	"
746	..	2.5		1.7	0 6	2 9	0.3	0.6	0.2½		"
74	..	2.3	1.5	1.6	0.6	2.9	0.3	0.6½	0.3		"
2231	..										"
	..	2.0			0.6		0.3	0.6	0.3		"
1785	..	2.2	1.2	1.6	0.7	2.7	0.4	0.5½	0.2½		"

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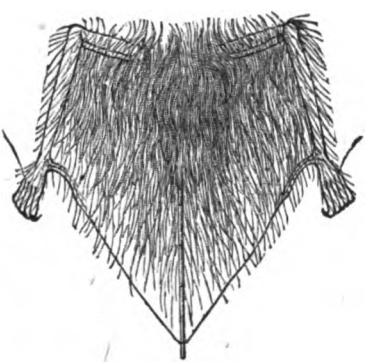
LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5331	1	James Bay, H. B.	C. Drexler.	Alcoholic.
5295	2	Moose Factory, "	" "	"
5301	1	Middleboro', Mass.	J. W. P. Jenks.	"
5427	1	Carlisle, Pa.	S. F. Baird.	Dry.
5305	1	" "	David Miller.	Alcoholic.
5337	1	West Philadelphia.	W. S. Wood.	"
5290	1	Mt. Holly, N. J.	Dr. Geo. C. Brown.	"
5296	1	Washington, D. C.	W. Wilson.	"
3328	1	Illinois River.	R. Kennicott.	"
5291	1	St. Louis, Mo.	Dr. Engelmann.	"
5293	2	Nebraska.	Dr. J. G. Cooper.	"
5294	1	Platte River.	W. S. Wood.	"
5431	2	Fort Union, Neb.	Dr. F. V. Hayden.	"
5359	1	" "	" "	"
5316	2	" "	" "	"
5429	1	Yellowstone River.	Col. Vaughan.	"
5289	1	Puget Sound.	Dr. Kennedy.	"
5321	1	Fort Reading, Cal.	Dr. T. F. Hammond.	"
5292	1	United States.	?	"
4729	1	" "	Major Leconte.	"

Fig. 37.



S. noctivagans.

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Scotophilus hesperus, ALLEN.

The Western Bat.

Fig. 38.

Fig. 39.

Description.—Diminutive. Head small, flat; face blunt and stout, not hairy. Tragus short, blunt, slightly concave on inner, convex on outer border, causing it to incurve. Thumb small; nail dull and minute; foot very small; wing membranes attached to base of toes. Interfemoral membrane ample. A small excalcaneal lobe of membrane—the termination of calcaneum blending with the membrane. The tip of the tail is not exserted. Body rather slender.

The fur is somewhat scanty; it is thickest on the back where it is of an obscure dirty gray, blending in some individuals to a brownish color—that in front being thinner and of a lighter hue. The main bulk of the fur is of a dark plumbeous, the above-mentioned colors constituting the tips only.

Dentition.

Molars $\frac{5}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{5}$ = 34 teeth.

Upper Jaw.—The incisors—both central and lateral—unicuspid, and of equal length; the canines moderately developed; the first premolar is very small, wedged in between the canine and the second premolar, which is large, as in other species of *Scotophilus;* the molars as usual.

Lower Jaw.—The incisors and canines not peculiar; the premolars two in number: the first is small, and is unicuspid, the second larger with an obscure basal cusp. The skull is eminently *Scotophiloid*, being flat and broad.

This bat resembles the *S. pipistrellus*, of Europe, in the contour of the head, the shape of the ear and tragus, the smallness and shape of the thumb and nail, the character of the interfemoral membrane, and in the style of coloring. The greater part of the

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fur in both is of dark plumbeous, the tip alone being a hue at variance with it. These tips in *S. hesperus* are brownish-gray and fawn, in *S. pipistrellus* being a rich olive-brown. In size it corresponds to that small European group with incurved tragus and rounded ear, of which *S. alcythoe* and *S. aristippe* are members. It differs from it, however, in the additional molar on the upper jaw. *S. hesperus*, therefore, is a form uniting, so far as can now be determined, the peculiarities of *S. pipistrellus* and *S. alcythoe* and *aristippe*.

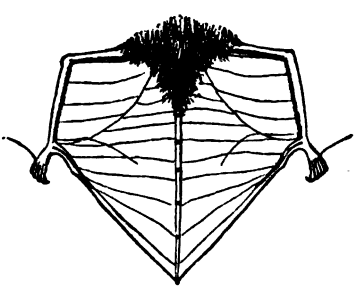
MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5406	..	1.4	1.0	1.1	0.5	1.8	0.1	0.3	0.1½	7.0	
6015	..	1.4	?	1.1	0.5	1.6	0.1½	0.5½	0.1½	?	
5510	..	1.9	0.11	1.4	0.4	2.0	0.1½	0.4	0.1	7.0	

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'n.
5406	1	Ft. Yuma, Cal.	Maj. G. H. Thomas.	Alcoholic.
5510	1	Posa Creek, Cal.	Dr. A. L. Heermann.	Dry.
5509	1	" " "	" "	"

Fig. 40.



S. hesperus.

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A bat, labelled 5345, Cass Co., Mo., presented by Dr. P. R. Hoy, presents peculiarities so marked that it cannot be assigned to any of the foregoing species. It belongs, however, to the group characterized by the small and equal superior incisors, of which *S. georgianus* and *S. hesperus* are the representatives. Indeed, the dentition throughout is similar to that seen in *S. georgianus;* and the *tout ensemble* of the animal indicates that it has a closer affinity to the former than to the latter of these species.

The head is flat and broad; lips slightly tumid; nostrils opening sublaterally, placed near the lip; the snout rather thick, and scarcely if at all emarginated; auricles of a light brown color, not quite as long as head, subulate, tip turned slightly outwards; internal basal border *not bluntish and rounded as in other species of Scotophilus, but markedly and sharply produced, as in Vespertilio.* Tragus similar to that of *S. georgianus*, short, stout; outer border strongly convex. Wing membrane of a blackish-brown color, attached to base of toes; foot rather large. Interfemoral membrane ample. Termination of calcaneum not abrupt. Tip of tail exserted, half the length of terminal caudal segment. Color very similar to that of *V. subulatus*—the fur of the back being more olive.

The above brief description agrees with that of *S. georgianus*, on the one hand, in the dentition, shape of tragus and style of wing membrane; with that of *V. subulatus*, on the other, in the shape of auricle, and in the coloring of the fur.

I have deemed it sufficient to thus indicate the peculiarities of this individual, without venturing upon a specific name, preferring to await the receipt of additional specimens.

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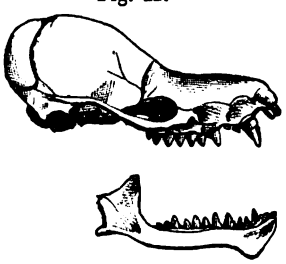
VESPERTILIO, Keyserling & Blasius.

Vespertilio, Keyserling & Blasius, Wirbel thiere Europas, 1840, 17.

Molars $\frac{6}{6}$; skull inflated, raised above the line of the nasal bones; internal basal lobe of ear sharply defined, more or less acute.

Fig. 41.



V. subulatus.

The term *Vespertilio* has been variously applied by authors. As employed by Linnæus, it represented a group now considered to be an entire order—*Cheiroptera*. When Geof. St. Hilaire revised the bats, he restricted the name to the naked-nosed forms with the tail inclosed within the interfemoral membrane. It has again been divided by numerous authors, among whom may be mentioned Isidore Geoffroy, Temminck, Gray, Keyserling & Blasius, until at present as properly restricted by the latter accomplished naturalists, it is used to designate a small but well defined group, the members of which embrace the most delicate forms of *Vespertilionidæ*. Owing to the fact that species of the genus have a widely spread distribution, minute differences in form and color in specimens brought from distant localities have been made of more importance than they deserve. Species have thus sprung up, many of which have never been identified, and serve only to retard progression by a useless synonymy.

Some of the many so-called species of this country I have been enabled to determine; with others, however, I have not been so successful. The names of the former are mentioned as synonyms to those having the priority. With the remainder I am obliged to content myself with merely naming, viz.: *V. subflavus*, *V.*

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crassus, Fr. Cuv.; *V ferrugineus*, *V. erythrodactylus*, Temm.;[1] *V. megalotis*, *V. phaiops*, *V. melanotis*, *V. cyanopterus*, *V. mystax*, Raf.;[1] *V. virginianus*, *V. leibii*, Bachman.[1]

We cannot do better here than introduce the remarks of Major Leconte, inserted at the close of his Observations quoted above, relative to these species:—

"Of bats described by others, the following with but one exception, I have never seen. Dr. Bachman, in the eighth vol. Jour., mentions four species. *V. monticola*, he says, resembles Say's bat; what species he calls by that name I cannot discover. *V. virginianus* seems to be the *V. humeralis* of Rafinesque. I have not seen this last for several years, and therefore cannot pronounce definitely concerning it. The *V. leibii* and *V. californicus* are equally unknown. Of M. Rafinesque's species, it is impossible to determine the following; there is good reason to doubt, however, whether they are distinct from others which are well known: *V. cyanopterus*, *V. melanotis*, *V. calcaratus*, *V. phaiops* (afterwards described in his Annals of Nature, No. 1, as his *Eptisecus melanops*); *V. megalotis*, *V. mystax* (afterwards called, in the Journal de Physique, Vol. LXXXVIII, p. 417, *Hyperodon mystax* and *Eptisecus melas*). M. Cuvier's *V. salarii* may be the *fuscus*, and his *subflavus* the *carolinensis*; his *crassus* likewise I cannot determine. M. Temminck's *V. erythrodactylus*, Temm. Vol. II, p. 235, remains amongst those unknown to me."

Such are the conclusions of an accomplished naturalist! After careful study he can only conjecture what *might* have been the meaning of his authors. Rafinesque, with whom rests the greater part of the blame of this faulty and careless observation, seems to have been utterly regardless of the existence of specific characters. Many of his descriptions are mere words, seldom conveying any definite impression to the mind; and if they are so far successful, it is rarely a correct one. But the work of this eccentric naturalist was excusable when compared with that of F. Cuvier. This gentleman had received from Major Leconte a collection of North American Bats, the new species of which he described.[2] But so carelessly was this work performed that out of his descriptions, six in number, the donor could recognize but two—*V. georgianus* and *V. gryphus*, the latter being a synonym of *S. fuscus*. The

[1] *Vide* Appendix (for all these descriptions). [2] *Vide* Appendix.

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descriptions of Dr. Bachman are also very imperfect. The most valuable points—such as the attachment of wing membrane to the feet, and the number of molars—being omitted.

In the new species which I have deemed it necessary to introduce, I much regret that from the above list I could not retain any names. As objectionable as it is to increase the number of species of *Vespertilionidæ* when there are so many yet undetermined, it would be still more so to apply to forms thought to be distinct names to which no specific characters have been attached, or which, if applying to good species, are descriptive of peculiarities not found in those about to be given.

The species may be arranged as follows:—

1. Internal basal lobe of ear acute.
   - *a.* Point of tail very slightly exserted { Ears longer than head . *V. evotis.* / Ears as long as head . *V. nitidus.*
   - *b.* Point of tail decidedly exserted.
     - Tragus linear, turned outward . . . *V. subulatus.*
     - Tragus linear, erect.
       - Color beneath chestnut-brown . . . *V. yumanensis.*
       - Color beneath whitish . . . . *V. affinis.*
2. Internal basal lobe of ear obtuse, rounded . . . *V. lucifugus.*

Vespertilio evotis, Allen, n. s.

Fig. 42.

Fig. 43.

Description.—Head rather small; face pointed, moderately whiskered; snout produced; ears large, high, erect, oval, not

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turning outwardly; long, sub-acuminate slightly diverging tragus; thumb slender; foot of moderate size; ample interfemoral membrane; last joint of tail exserted. The membranes are of a light brown color, tending in some to a darker hue. Hair long and soft, plumbeous at base behind, with light brown tips inclined to yellowish toward the head.

The fur in front is dark maroon, or black at base with whitish tips. The basal third of the ear is covered with hair at base: at the base of the interfemoral membrane behind a tuft of hair is seen.

In two specimens the fur had a darker tinge, the tips behind being dark olive-brown, the base being black.

This species has the largest ear of any of the American species of *Vespertilio*.

The cranium is greatly inflated; the face slender and pointed.

Dentition.

Molars $\frac{6}{6}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{6}{6}$ = 38 teeth.

Upper Jaw.—The incisors are grouped in pairs near the canines, separated by an open space. The centrals are markedly bifid, the laterals obscurely so. Of the premolars the first two are very small, the second being the smaller; the third is larger, compressed and bicuspid, the outer cusp much the larger, and longer than any point of the molars proper. The remaining molars not peculiar.

Lower Jaw.—Incisors trifid, the one adjacent to the canine on either side obscurely quadrilobed. Canines with a small basal cusp behind. The premolars small, the two anterior most so, the third is slender; basal ridge thick.

No specimens have been received from localities east of the Rocky Mountains. It appears to be comparatively common along the Pacific coast from Puget Sound to Lower California.

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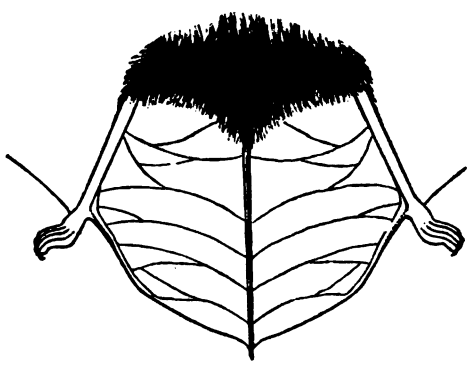
Measurements.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5390*a*	..	1.8	1.5½	1.5	0.8	2.3	0.4	0 8	0.5	9.0	Alcoholic.
5390*b*	..	1.6	1.4	1.5	0.8	2.3	0.3½	0.6	0.5	9.0	"
5390*c*	..	1.6	1.4	1.5	0.8	2.3	0.3½	0.8	0.4½	9.0	"
5389	..	1.6	1.6	1.6	0.7	2.3	0 3	0.11	0.5½	9 6	"
5392*a*	..	1.6	1.6	1.6	0.7½	2.4	0.3	0.8½	0.6	10.0	"
5392*b*	..	1.6	1.6	1.6	0 7	2.3	0.3	0.9	0.6	10.0	"
5392*c*	..	1.6	1.6	1.5	0.6	2.3	0.3	0.8	0.6	10.0	"
5391*a*	..	1.6	1.6	1.5	0.6	2.3	0.3	0.9	0 6	8.7	"
5391*b*	..	1.6	1.6	1.5	0.6	2.3	0.2½	0.9	0.6	8.6	"
5413	..	1.4	1.4	1.5	0.7	2 1	0.2½	0 9	0.5	?	"
	..	1.6	1.6	1.5	0.7	2.3	0.3	0 11	0.5	8.9	"
5395	..	1.6	1.6	1.5	0.8	2.3	0.3	0.11	0.5	9.0	"
5413	..	?	2.0	1.6	?	2.6	0.5	0.7½	0 4	8.6	Dry.
1789	..	2.0	1.3	1.6	0.8	2 0	0.5	0.7	0.3	?	"

List of Specimens.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'm.
5392	3	Upper Missouri.	Dr. Hayden.	Alcoholic.
5390	3	Puget Sound. [B. Surv.)		"
5391	2	East of Colville. (N. W.	Dr. C. B. Kennerly.	"
5389	1	Monterey, Cal.	A. S. Taylor.	"
5387	2	Cape St. Lucas.	John Xantus.	"
5395	1	?	?	"
5413	1	Mts. of N. Mexico.	Capt. Pope.	Dry.

Fig. 44.



V. evotis.

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Vespertilio subulatus, Say.

The Little Brown Bat.

Fig. 45.

Fig. 46.

Vespertilio subulatus, Say, Long's Exp. to Rk'y Mts. II, 1823, 65 (note).—Harlan, Fauna Americana, 1825, 22.—Richardson, Fauna Bor. Amer. I, 1829, 3.—Godman, Amer. Nat. Hist. I, 1831, 71.—Cooper, Ann. Lyc. N. Y. IV, 1837, 61.—DeKay, Nat. Hist. N. Y. (Zool.) 1842, 8.—Wagner, Schreb. V, 1855, 750.—Leconte, Proc. Acad. Nat. Sci. Phila. 1855, 436.

Vespertilio californicus, Bachman, Journ. Phila. Acad. Nat. Sci. 1842, 280.—Peale, U. S. Explor. Exp. (Mam.) 1858, 3.

Vespertilio caroli, Temm. Monog. II, 1835, 237.—Wagner, Schreb. Saüg. V, 1855, 749.

Vespertilio domesticus, Gerbe, Cab. Nat. Hist. II, 290.

Description.—Head light, moderate size; face whiskered; ear smaller than in *V. evotis*, turned slightly outwards; tragus erect, half the height of the ear; the interfemoral membrane smallest, the point of tail exserted.

The fur is not so thick as in *V. evotis*. The base of the hair behind is of a dark plumbeous color, tips olive-brown; the base in front is of the same hue, blending into a whitish-yellow tip. The color is subject to little variation; the olive-brown of the back is, in some specimens, of a lighter hue. The distribution as in other species.

Dentition as in *V. evotis*.

The specimens of *V. subulatus* arrange themselves into two groups, one of which may be considered typical, the other tending in the shape of ear to the *preceding* species. Indeed the change from one species to the other is so gradual that it is difficult to assign the boundary to each. I have included under *V. subulatus* a number of specimens which have the ear higher than those from

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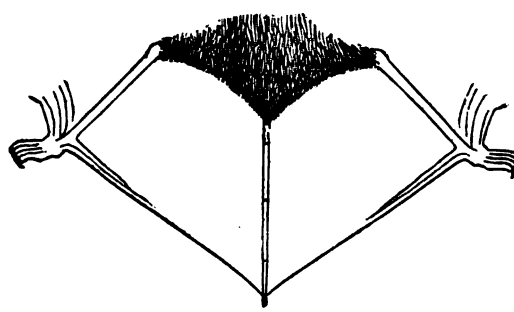
which the description has been taken, but agreeing with *V. subulatus* in other particulars.

Hab.—Very common, especially in the country east of the Rocky Mountains, where it is the most abundant of the species of *Vespertilio.*

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5382	..	1.6	1.4	1.4	0.7½	2.1	0.3	0.7	0.6	9.0	
5384	..	1.6	1.4	1.4	0.7½	2.3	0.3	0.7	0.3	9.0	
5346	..	1.6	1.4	1.4	0.7½	2.2	0.3	0.7	0.3	9 0	
	..	1.8	1.4½	1.4	0.7	2.3	0.3	0.6½	0.3	9.0	
5385	..	1.6	1.5	1.3	0 4½	2.1	0.2½	0.7	0.3	8.0	
5370	..	1.6	1.4	1.2½	0.4½	2.2	0.3	0.7½	0.3	9.0	
5393	..	1.6	1.5	1.4½	0 5	2.3	0.3	0.7	0.3	9.0	
5352	..	1.10	1.8	1.6	0.5½	2.4	0.3	0.7	0.4	9.2	

Fig. 47.



V. subulatus.

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LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5334	1	Nova Scotia.	Dr. Gilpin.	Alcoholic.
5370	1	Brunswick, Me.	A. S. Packard.	"
5385	1	Elizabethtown, N. Y.	S. F. Baird.	"
6322	1	Nebraska.	Dr. Cooper.	"
5385	1	Phillipsburg, Pa.	A. Brakeley.	"
5382	1	Bradford, Pa.	C. C. Martin.	"
5381	1	Meadville, Pa.	J. F. Thickstun.	"
7196	1	Beaufort, S. C.	Dr. Hayden?	Dry.
7197	1	" "	" "	"
3721	1	Michipico, L. Sup.	C. A. Hubbard.	"
5355	1	Portage, Lake Sup.	B. A. Hoopes.	Alcoholic.
5351	1	Upper Mis. River, Ill.	R. Kennicott.	"
5312	1	Racine, Wis.	Dr. P. R. Hoy.	"
5500	1	Gross Isl., Mich.	C. Fox.	Dry.
5318	1	" "	" "	Alcoholic.
5338	1	Detroit, Mich.	Capt. Gunnison.	"
5391	1	Brookville, Ind.	Dr. R. Haymond.	"
5348	1	Southern Illinois.	R. Kennicott.	"
5346	2	St. Louis, Mo.	Dr. Engelmann.	"
5531	1	Upper Missouri.	Dr. Hayden.	"
5362	1	Sonora.	Arthur Schott.	"
5435	1	"	J. H. Clark.	Dry.
5432	1	?	?	"
5503	1	?	?	"
5441	1	Sonora.	J. H. Clark.	"

Vespertilio affinis, ALLEN, n. s.

Fig. 48.

Fig. 49.

Description.—Head moderate, slightly depressed; face hairy; ears rather small, inner border convex, outer border concave. Tragus is subulate, about half as high as the ear, straight on internal side, diverging on the external. Lip whiskered. Body robust. Feet long and slender—a few curved hairs at the base of the nails; wing membranes attached midway to base of toes. Interfemoral membrane rather small; a little lobe at the termination of the calcaneum; point of tail exserted. Thumb rather large. Wing membranes dark brown, but thin.

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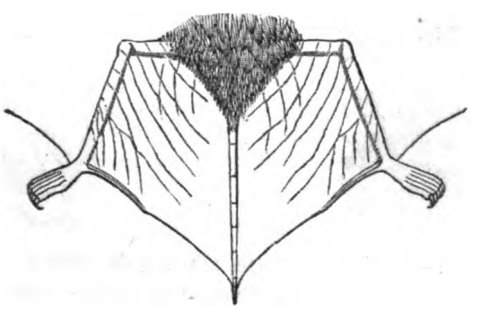
Fur thicker behind than before, and extending a slight distance on the interfemoral membrane. Color lustrous light chestnut-brown above; same color of a lighter shade, inclining to yellowish, below. The base of the fur above and below is of a delicate fawn brown.

The *dentition* is the same as in *V. evotis*—the incisors being of the same length, the laterals bicuspid.

V. affinis resembles *S. georgianus* in being about the same size, and in the fur and membranes presenting the same general appearance. It differs from that species in having the ear more emarginated on the outer border; the tragus not blunt, nor so wide proportionately; the face more hairy, and not so depressed; the reddish hue of the hair more decided; the fur thicker and less wavy. The dentition differs in there being $\frac{6}{6}$ molars, instead of $\frac{5}{5}$. *V. affinis* has also a narrower interfemoral membrane, and a marked calcaneal lobe.

To *V. yumanensis* it bears some resemblance in the shape and extent of the interfemoral membrane, and shape of tragus; but the differences in the pelage, and the color and texture of the wing membranes separate them.

Fig. 50.



V. affinis.

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MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5342	..	1.1	1.1	1.4	0.6½	2.3	0.4	0.6	0.3	9.0	Alcoholic.

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'm.
5342	1	Ft. Smith; Ark.	Dr. Shumard.	Alcoholic.

No specimens have reached us from any other locality.

Vespertilio lucifugus, LECONTE.

The Blunt-nosed Bat.

Fig. 51.

Fig. 52.

Vespertilio lucifugus, LECONTE, Cuv. An. Kingdom (McMurtrie ed.) I, App. 1831, 431.—IB. Proc. Acad. Nat. Sci. 1855, 436.

Vespertilio brevirostris, MAX PRINCE WIED, Verzeich. beobach. Säug. N. A. 1860, 19.

Description.—Head rather large, somewhat flattish; lips moderately whiskered; snout more obtuse than in other species of *Vespertilio;* nostrils sub-lateral, some distance from free border of upper lip; ears narrow, blunt at tip, slightly emarginated on outer side: the internal basal lobe produced, rounded and somewhat obtuse, not thicker than other portions of ear. Tragus half as high as auricle, mostly blunt, unfrequently abruptly acuminate. Mental space well defined. Feet large; interfemoral membrane of moderate size; termination of calcaneum with interfemoral somewhat abrupt; the point of tail exserted.

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Coloration subject to little variation, that of the back dark plumbeous at base, with dark or lightish olive-brown tips; that of the belly lighter at tip—exhibiting a whitish gray, or yellowish gray appearance. The color is thus similar to that of *V. subulatus*.

Dentition as in *V. evotis*.

The narrow blunt ear, short face, and the elevation of the nostril above the free margin of upper lip are the characters which serve to distinguish this species.

V. daubentonii, of Europe, bears some resemblance to this species in the shape of the ear and tragus; but it is dissimilar in the whitish color of fur beneath, and in the attachment of the wing membrane to foot, which is here joined to the ankle instead of the base of the toes as in *V. lucifugus*.

The specimen, numbered 5538, from the east of Colville, N. W. Territory, has a pointed tragus, and the middle part of the free border of the interfemoral membrane fringed with stiff hairs. The fur of the body is silvery beneath, blackish above, back of feet not hairy. Another form from St. Louis, Mo. (Cat. No. 5344), has the wing membrane attached to the ankles—the foot being entirely free. In other respects both agree with *V. lucifugus*.

I have thought it necessary to thus briefly indicate these two aberrant individuals, without giving any separate account of them. Should future collections bring forward any others having the same peculiarities as the above, they may possibly then be thought worthy to receive specific names.

Hab.—Quite common, and universally distributed throughout the United States, and south to the Isthmus of Panama.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5336	..	1.10	1.5	1.5	0 7	2.6	0.2½	0.6	0.2	9.0	Alcoholic.
	..	1.9	1.5		0.6½	2.4	0.2½	0.6	0.3	8.6	"
5353	..	1.9	1.6	1.4	0.4	2 5	0 3	0 7	0.3	8.0	"
5347	..	1.9	1.6	1.4	0.4½	2.5	0 3	0 6½	0 3	8.9	"
5376	..	1.9	1.6	1 4	0 4	2 5	0.3	0.7	0.3	8.9	"
5401	..	2 0	1 6	1.7	0.8	2 6	0.3	0.7	0.4	10.0	"
5364	..	1.6	1 3	1.3	0.6	2 3	0.3	0.6	0.2½	8 0	"
5377	..	1.9	1.3	1.3	0.7	2.2	0.2½	0.6	0.3	9.0	"

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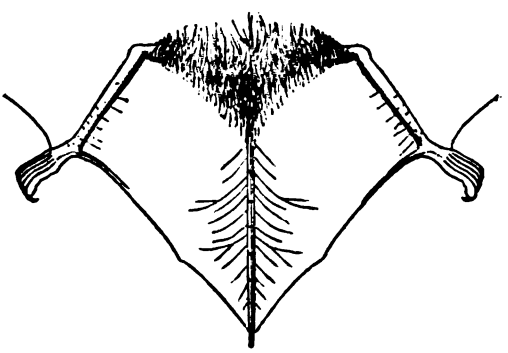
LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'm.
5376	1	James Bay, Hudson's B.	C. Drexler.	Alcoholic.
5335	1	Westport, N. Y.	S. F. Baird.	"
5334	2	" " ?	" " ?	"
5336	3	Foxburg, Pa.	" "	"
5338	1	Washington, D. C.	" "	"
5337	2	" "	C. Gerard.	"
7197	1	Beaufort, S. C.	Dr. Hayden.	"
7198	1	"	" "	"
5319	1	Isle Royale, Lake Sup.	B. A. Hoopes.	"
5354	1	Detroit River.	S. F. Baird.	"
5301	1	Grosse Isle, Mich.	Rev. C. Fox.	Dry.
5500	1	" "	" "	"
5505	1	" "	" "	"
5373	1	Wisconsin.	A. C. Barry.	Alcoholic.
5498	1	Racine, Wis.	Dr. P. R. Hoy.	Dry.
5349	5	Cook Co., Ill.	R. Kennicott.	Alcoholic.
5497	1	" "	" "	Dry.
5347	2	Cairo, Ill.	" "	Alcoholic.
5363	1	Fort Pierre, Neb.	Dr. Hayden.	"
5379	1	Santa Fé, N. M. [N. N.	W. J. Howard.	"
5374	2	Cantonment Burgwyn,	Dr. Anderson.	"
5361	5	Puget Sound, W. T.	A. Campbell.	"
5366	3	" ? "	Dr. Suckley.	"
5378	2	Fort Stellacoom, W. T.	" "	"
5299	1	Columbia River.	U. S. Exp. Exped.	"
5403	2	Fort Reading, Cal.	Dr. J. F. Hammond.	"
5364	2	" " "	" "	"
5383	2	Cape Flattery, W. T.	Lt. Trowbridge.	"
5380	1	?	?	"
5377	1	?	?	"
5373	1	Aspinwall, N. G.	Dr. S. Hayes.	"

Fig. 53.



V. lucifugus.

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Vespertilio yumanensis, ALLEN.

The Gila Bat.

Fig. 54.

Fig. 55.

Description.—Head moderate, not depressed; hairy. Ears ellipsoid, very slightly emarginated on the outer border. Tragus subulate, half the height of the ear, straight on internal, convex on external border. Nostrils elliptical, opening sublaterally; space between them naked, and slightly emarginated. Lips moderately well covered with whitish whiskers. Body slender. The feet are large, the wing membrane attached midway to the base of the toes. Interfemoral membrane triangular, the termination of the calcaneum forming a lobe with the membrane; the point of tail exserted. The thumb moderate. Wing membranes thin, light color, and almost diaphanous.

The hair behind is plumbeous at base, and light brown at the tip. That in front dark umber at base, and grayish-white at tip—the white hue being predominant. The distribution of fur is the same as in other species.

Dentition same as in *V. evotis.*

In general appearance this bat resembles both *V. subulatus* and *Scotophilus georgianus.* It is, however, smaller than the former, the membranes more delicate, the foot proportionately larger, the interfemoral membrane smaller; but it agrees with it in the subulate tragus, and in the dentition. Its relation to *S. georgianus* is seen in the light brownish snout and ear; its variance therefrom in the longer and more acuminate tragus, the smaller size of the thumb, and the difference in the number of molars.

Hab. This species has not been received from any other locality than the one above given. It was sent to the Institution, from Fort Yuma, with the original type of *Macrotus californicus,* by Major (now Major-General) George H. Thomas, U. S. A.

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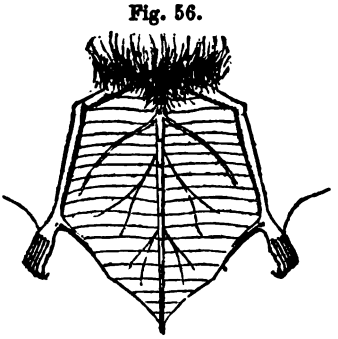
MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5367	..	1.6	1.4	1.4	5.0	2.3	0.4	0.6	3.0	9 0	Alcoholic.
6019	..	1.6	1.4	1.3	5.0	2.2	0.4	0.5½	3 0	8.10	"
6020	..	1.6	1.4	1.2	6.0	2.1	0.4	0.5½	3.0	8.6	"
6021	..	1.6	1.4	1.0	6.0	2.2	0.4	0.6	3.0	8.6	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5367	36	Ft. Yuma, Cal.	Maj. G. H. Thomas.	Alcoholic.
6019	1	" "	" " "	"
6020	1	" "	" " "	"
6021	1	" "	" " "	"

Fig. 56.



V. yumanensis.

Vespertilio nitidus, ALLEN.

The Californian Bat.

Fig. 57.

Fig. 58.

Vespertilio nitidus, ALLEN, Proc. Phil. Acad. Nat. Sci. 1862, 247.

Description.—Body small; head and face very hairy, the nostrils separated by a narrow, slightly emarginate space; ears longer than head, slightly emarginate on outer edge, curving somewhat outwards, hairy at basal third behind, extending up a greater distance on the inner side; tragus tapering, leaning a little outwards, and about half the height of auricle; lips extensively whiskered; thumb and foot small; interfemoral membrane ample, sparingly haired at upper half behind; calcaneum rather long, with an excalcaneal membrane; color of membranes darkish brown; tip of tail rarely exserted. The termination of the calcaneum forms no angle with the interfemoral membrane.

Fur long and silky. Color plumbeous at base with russet brown and olive tips behind, and lighter russet or ashy cinereous in front. Interfemoral membrane naked, except the usual tuft at the base behind, and a few lightish hairs arranged transversely in front.

Dentition as in *V. evotis.*

This species bears a strong resemblance to *Vespertilio mystacinus,* Leisler, of Europe. The emarginate ear, elongate tragus, and whiskered lips are seen in both; but our species is the larger, while the thumb is smaller; the tail is shorter, and calcaneum more produced. It differs also in color—*V. mystacinus* being of a grayish brown, *V. nitidus* a reddish brown.

Nos. 5405, 5537 and 5402—four specimens in all—present the following peculiarities: The fur is longer than in others of the collection. On the back the base of the hair is blackish; upper third pale yellow, turning to a delicate light-yellowish russet brown; on the belly the hair is dark at the base, with light tips; the hairs on

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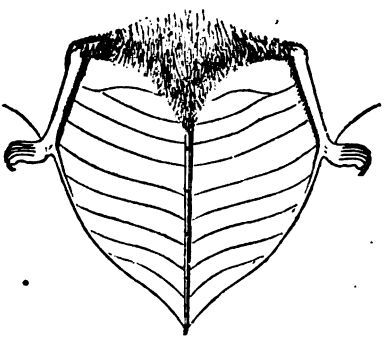
the interfemoral membrane are also of a light color. In other respects the characters are the same as the other specimens. The dried specimen, No. 5512, labelled by Dr. Leconte *V. oregonensis*, though never described by him, probably belongs to this variety. If the individuals having the above coloration should be found to constitute a new species, this name will be reserved for it.

Hab. The species appears, as far as known, to be confined to the regions west of the Rocky Mountains.

Fig. 59.



V. nitidus. (Slightly enlarged.)

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5433	..	1.8	1.3	1.3	0.6	2.3	0.3	0.5	0.2½	8.0	Dry.
5432	..	1.8	1.0	1.3	0.6	2.0	0.3	0.6	0.3	8.0	"
5446	..	1.6	1.0	1.2	0.6	1.9	0.2	0.4	0.2	7.0	"
523	..	1.7	1.0	1.3	0.6	2.0	0.3	0.5	0.2½	7.9	"
5444	..	1.3	1 1	1.2	0.5	1.9	0 2½	0.4½	0.2½	7.0	"
525	..	1.7	1.2	1.3	0.6	2.0	0.3	0.4½	0.2½	7.7	"
1207	..	1.7	1.2	1.3	0.6	2.9	0.3	0.4½	0.3	?	Alcoholic.
5498	..	1.6	1.5	1.2	0.6	2.0	0.3	0.6	0.3	7.9	"
5500	..	1.7	1.4	1.2	0.7	2.3	0.3	0.5	0.3	8.5	"
5499	..	1.6	1.2	1.2	0.6	2.1	0.3	0.5	0.3	7.9	
5368	..	1.6	1.3	1.2	0.6	2.1	0.1½	0.6	3.0	8.0	"
	..	1.5	1.4	1.1½	0.6	2.1	0 2	0.6	3.0	8.6	"
5535	..	1.6	1.1	1.2	0.6	2.0	0.2	0.6	3.0	7.6	"
5536	..	1.5	1.6	1.2	0.6½	2.1	0.2½	0.6	3 0	8.0	"
5565	..	1.6	1.3	1.3	0.6	2.6	0.2	0.6	3.0	8.0	"
5534	..	1.4	1.2	1.1½	0.5½	2.0	0.1½	0.6	3.0	7.0	"
5537	..	1.5	1.3	1.2	0.6	2.3	0.2	0.6	3.0	8.0	"
5405	..	1.6	1.2	1.2	0.6½	2.1	0.2	0.6	3.0	8.0	"

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LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Specimen.
5432	1	Guadalupe Cañon, N.M.	Capt. J. Pope.	Dry.
5436	1	Pecos River, Tex.	" " "	"
5394	1	Santa Fe, N. M.	W. J. Howard.	Alcoholic.
5536	1	East of Fort Colville.	A. Campbell.	"
5583	6	Puget Sound.	" "	"
7004	1	" "	" "	"
5368	1	Fort Steilacoom, W. T.	Dr. Geo. Suckley.	"
5535	1	" " "	" " "	"
5444	1	" " "	" " "	Dry.
5446	1	" " "	" " "	"
5434	6	" " " ?	" " "	Alcoholic.
7005	1	San Francisco, Cal.	R. D. Cutts.	"
5437	1	Monterey, Cal.	W. Hutton.	"
1207	1	" "	A. S. Taylor.	"
5368	17	Fort Tejon, Cal.	John Xantus.	"
5405	1	Fort Yuma, Ariz.	Maj. Geo. H. Thomas,	"
5537	2	" "	" " [U. S. A.	"
5533	1	Cape St. Lucas.	John Xantus.	"
5402	1	" "	" "	"
5398	1	" "	" "	"

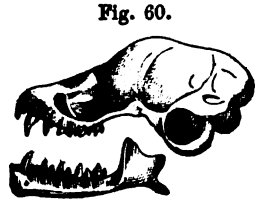
SYNOTUS, KEYSERLING & BLASIUS.

Synotus, KEYSERLING & BLASIUS, Wiegm. Archiv für Naturg. 1839.

Ears very large; outer border extended anteriorly as far as the tragus; large excrescences on either side of the nose continuous with the inner border of the ear; semicircular fold on the base of the outer border of the ear; no tongue-shaped appendage at the base of the inner border, as in *Plecotus*.

The genus *Synotus*, as represented by Keyserling & Blasius, includes both the species found in the United States. It is closely allied to *Plecotus* (a European genus), as both are to *Vespertilio*.

Fig. 60.



S. macrotis.

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Skull.—Rather large. Cranium inflated; a small median depression on the face. No occipital crest.

Dentition.

Molars $\frac{5}{6}$. Canines $\frac{1}{1}$. Incisors $\frac{4}{6}$. Canines $\frac{1}{1}$. Molars $\frac{5}{6}$=36 teeth.

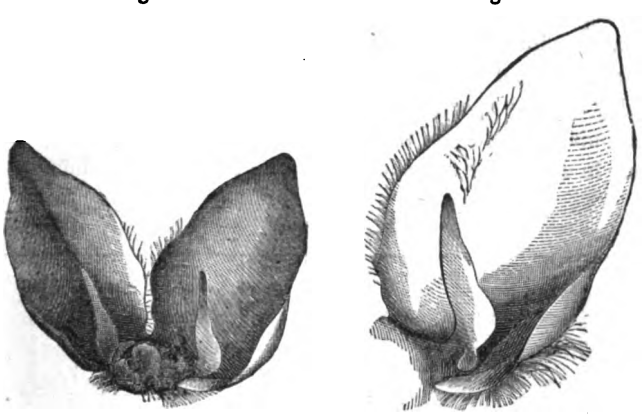
Upper Jaw.—Incisors separated by a median space. The centrals larger than laterals, converging, not bifid. The laterals very small and simple. Canines moderate, with a minute basal cusp anteriorly. First premolar very small; second with a large external and small internal cusp. The molars not peculiar.

Lower Jaw.—Incisors minutely trifid. Canines with a minute basal cusp anteriorly. Of the premolars the first and second are small, and about equal; the third much larger though simple.

Synotus macrotis, Allen.

The Big-eared Bat.

Fig. 61. Fig. 62.



Plecotus macrotis, Leconte, Cuv. Animal Kingdom (McMurtrie ed.), Appendix I, 1831, 431.

Plecotus lecontii, Cooper, Ann. Lyc. N. Y. IV, 1837, 72.

Synotus lecontii, Wagner, Schreb. Säug. V, 1855, 720.

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Description.—Head flat, not very broad; face moderately hairy. Lips thin, compressed. Facial crest elevated on a line with the nostrils, which are small apertures with membranous edges, wider externally than internally. They open almost laterally, and have between them a shallow concavity. Ears very large, slightly haired at internal border. The tragus is one-half the height of the ear, straight on the inner edge, diverging on the outer, with a circular lobe at the base almost at right angles to the tragus proper. Hair long, fine and soft. Above it is dark at base—almost blackish; tips dusky, approaching to brown. The base of ear covered with hair—a delicate line extending up the internal border.

The fur of the belly is like that of the back, blackish at base with grayish tips running to white toward the pubis. Interfemoral membrane naked; base of thumb naked. Thumb and foot slender; a few long hairs are seen on the back of the latter.

Originally described by Major Leconte, this species was renamed by Mr. Cooper, as above cited. This naturalist argued that the inappropriate title was sufficient excuse for rendering it obsolete. In reproducing the appellation of Leconte, I consider that, however unfortunate an author's selection of a specific name may be, this alone is no reason why he should be deprived of the right to the priority of the description.

Hab. Confined to the South Atlantic States.

I am informed by Prof. Baird that specimens of a *Synotus*, probably of this species, were received some years ago by the Smithsonian Institution, from Meadville, Pa., but that they have become in some way misplaced and are not now to be found.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5232	..	1.8	1.7	1.7	0.8	2.8	0.4	1.1	0.6	9.6	Alcoholic.
	..	1.8	1.7	?	0.8	2.6	0.4	1.1	0.6	9.4	"
1377	..	1.6	1.6	1.6	0.9	2.8	0.4	1.0	0.6	9.0	Dry.
4727	..	1.9	1.8	1.7	0.9	2.8	0.5	1.2	0.7	11.0	"
890	..	1.10	1.8	1.7	0.8	2.8	0.5	1.1	0.6	10.9	"

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LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'n.
5451	1	S. Carolina.	W. Cooper.	Dry.
5526	1	S. Carolina.	" "	"
5453	1	Society Hills, S. C.	M. A. Curtis.	"
5450	1	" " "	" "	"
5452	1	Kemper Co., Miss.	D. C. Lloyd.	"
5407	1	Eutaw, Ala.	Prof. Winchell.	Alcoholic.
	1	?	?	Dry.
5234	1	Micanopy, Fla.	Dr. Bean.	Alcoholic.
4727	1	"U. S."	Major Leconte.	Dry.
5252	1	Santa Fe.	W. J. Howard.	Alcoholic.

Synotus townsendi, WAGNER.

Fig. 63.

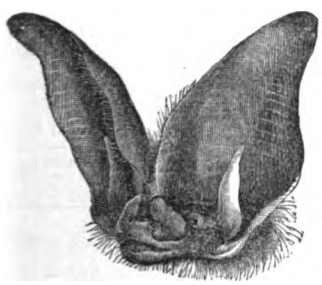
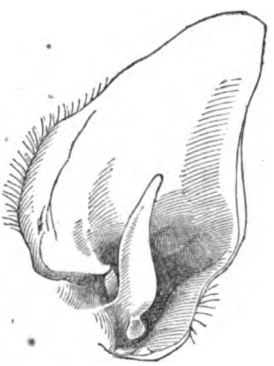


Fig. 64.



Plecotus townsendi, COOPER, Ann. Lyc. N. Y. IV, 1837, 73.
Synotus townsendi, WAGNER, Schreb. Saüg. V, 1855, 720.

This species resembles the above, but is considerably stouter, the membranes somewhat lighter; face broader and more elongate. The crests are high and well defined, with the wart between the internal border of ear and mouth larger than in *S. macrotis*. The tragus is of the same general shape, with the marked lobe at base. At the lower part of the outer border near the angle of the mouth the small internal lobe is seen as in the preceding species. Limbs slender; thumb and foot rather small.

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Hair everywhere thick, fine, and long. Brown above, not so markedly bicolored as in *S. macrotis*, but only of a slightly darker hue at base. It is lighter in front, where it assumes a slightly ferruginous brown color at base. The back of the foot but slightly furred. But slight variation in color in the different individuals. Dentition as in the preceding species, excepting that the central incisors of the upper jaw are more distinctly bifid at cutting edge.

Hab. Central region of the United States.

MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
5231	..	1.9	1.9	1.8	0.8	2.10	0.4	1.2	0.7	11.0	Alcoholic.
5230*a*	..	1.9	1.8	1.9	0.8	2.9	0.4	1.3	0.7	11.0	"
5230*b*	..	1.9	1.7	1.9	0.9	2.10	0.4	1.3	0.6	11.0	"
5230*c*	..	1.9	1.9	1.8	0.8	2.9	0.4	1.2	0.6	10.6	"
5230*d*	..	1.9	1.9	1.9	0.8	2.10	0.4	1.2	0.7	10.6	"
5230*e*	..	1.8½	1.9	1.8	0.8	2.11	0.4	1.2	0.6	10.0	"
5230*f*	..	1.9	1.9	1.9	0.9	2.11	0.4	1.3	0.7	11.0	"
5230*g*	..	1.9	1.8	1.8	0.8	2.10	0.4	1.2	0.6	10.6	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'm.
5231	1	Upper Missouri.	Dr. F. V. Hayden.	Alcoholic.
5230	7	Utah.	Capt. J. H. Simpson.[1]	"

[1] Collected by C. S. McCarthy.

ANTROZOUS, ALLEN.

Antrozous, ALLEN, Proc. Phila. Acad. Nat. Sci. 1862, 247.

Head rather large; nose high, tapering, narrow; snout angular, blunt; nostrils apical, outer borders joining above in a transverse line; eyes large; ears longer than head, not joined.

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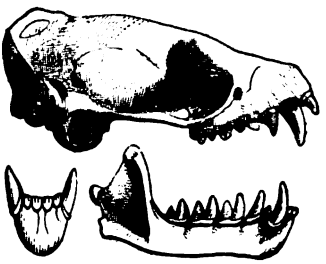
Fig. 65.



A. pallidus.

Skull long, not depressed, slightly crested at posterior part, tapering anteriorly.

Dentition.

Molars $\frac{4}{5}$. Canines $\frac{1}{1}$. Incisors $\frac{2}{4}$. Canines $\frac{1}{1}$. Molars $\frac{4}{5}$ = 28 teeth.

Upper Jaw.—The superior incisors large, pointed, separated by a narrow space. Canines well developed, with a small basal internal cusp. No small premolar posterior to canine, as in *Lasiurus;* molars as in that genus.

Lower Jaw.—Incisors trilobed, the two centrals placed anteriorly to laterals. Canines with an acute basal cusp which nearly touches the second premolar. The first premolar simple and smaller than the second. Molars not peculiar.

This genus differs from *Vespertilio* in the high and slender snout; the crested and narrow skull; the elevated broad ears, and in having one incisor less on either side in the upper and lower jaw. Indeed, the latter fact is alone sufficient to separate it, for although the incisors in the upper jaw as a general rule are subject to considerable variation, a departure from the usual number in the lower jaw is a matter of more significance. *Antrozous* is the only instance in this extensive family of such variation.

Major Leconte (Proc. Phila. Acad. Nat. Sci. VII, 1855, 437) described a bat from California under the name *Vespertilio pallidus.* The changes which have taken place in the classification of *Cheiroptera* of late years, and especially the greatly

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restricted sense in which the genus *Vespertilio* is now received, is sufficient apology for the insertion of this bat under the genus above proposed.

Antrozous pallidus, Allen.

The Pale Bat

Fig. 66.

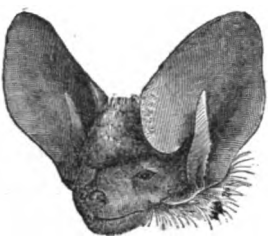

Fig. 67.

Vespertilio pallidus, Leconte, Proc. Acad. Nat. Sci. VII, 1855, 43.—Baird, U. S. and Mex. Bound. Survey, Report II, 1858, pl. i, fig. 1.

Description.—Head slightly hairy, and of a light brown color. A small wart over each eye; a larger one between outer border of ear and angle of mouth, and another under the lower jaw. Ears high, elliptical, furred at base posteriorly; a slip of fur running up along the inner border; a similar, but narrower slip, running up along the anterior part of the ear. Tragus half as high as auricle, lanceolate, in many instances terminating in a fine point, sometimes in a blunt one; straight on inner border, diverging on outer, where it is finely crenulate. The outer border of the ear does not reach the angle of the mouth by a distance of three lines. Feet rather large; calcaneum moderate.

Two varieties of color are observed in this species—the fawn and the yellowish-brown. The first was the one described by Major Leconte. This author says: "Hair light fawn colored, tip with darker, beneath paler." The yellowish-brown may thus be described: Hair above light brown at base, darker at tips; below lighter brown not tipped. In some instances the brown

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tip above assumes a reddish tinge, and the fur beneath becomes almost white. The interfemoral membrane is entirely naked. At the base of the thumb a few brown hairs are found.

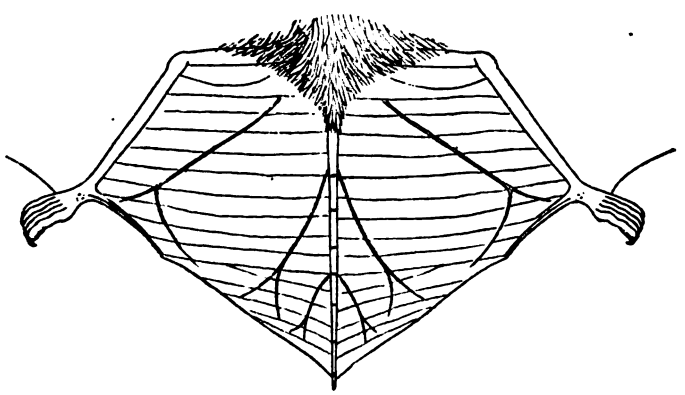
MEASUREMENTS.

Current number.	Original number.	From tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of longest finger.	Length of thumb.	Height of ear.	Height of tragus.	Expanse.	Nature of specimen.
152	..	2.10	2.0	2.0	0.9	3.0	0.4	0.10	0.6	12.0	Dry.
538	..	2.0	?	2.0	0.8	3.0	0.5	0.9	0.5	10.6	"
521	..	2.4	?	1.10	0.8	3.0	0.5	0.10	0.5	11.0	"
889	..		1.6	2.0	0.9	3.4	0.5	1.0	0.4	11.0	"
887	..	?	?	2.0	0.9	3.0	0.5	0.10	?	?	"
431	..	2.6	?	2.0	0.9	3.4	0.5	0.10	0.6	11.6	"
85	..	2.0	1.6	1.11	1.0	3.0	0.4	0.10	0.6	11.0	"
173	..	2.0	1.6	2.0	1.0	3.0	0.5	0.12	0.7	11.2	"
	..	2.4	1.6	2.0	0.10	3.4	0.5	1.1	0.7	11.6	"
45	..	2.5	1.9	2.0	0.9	3.5	0.5	1.0	0.7	12.0	"

LIST OF SPECIMENS.

Cat. No.	No. of Sp.	Locality.	Presented by	Nature of Spec'n.
152	1	El Paso. (Boundary Sur-	J. H. Clark. (Type.)	Dry.
5241	1	San Elizario, Tex. [vey.)	Dr. C. B. Kennerly.	Alcoholic.
5240	1	Ft. Bliss, N. M.	Dr. S. W. Crawford.	"
5455	1	Ft. Dalles, Oregon.	Dr. Geo. Suckley.	Dry.
538	1	Posa Creek, Cal.	Dr. A. L. Heermann.	"
521	1	Tejon Valley.	" "	"
5238	1	Ft. Tejon, Cal.	John Xantus.	Alcoholic.
5237	5	" " "	" "	"
5239	4	Ft. Yuma, Cal.	Maj. G. H. Thomas.	"
5236	19	Cape St. Lucas.	John Xantus.	"

Fig. 68.



A. pallidus.

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APPENDIX.

In order to enable the student to decide for himself in regard to the many doubtful or unidentified species of authors cited in the foregoing pages, the descriptions themselves are reproduced in the present appendix.

A.

RAFINESQUE.—American Monthly Magazine, III, 1817, 445.

1. *V. mystax.* (Whisker Bat).—Tail two-fifths of total length; upper incisors none, lower 6; two warts at the lower jaw; body entirely fallow, top of the head brownish; ears brown, auriculated, longer than the head. Length, 5 inches; breadth, 14 inches.

2. *V. humeralis.* (Black-shoulder Bat.)—Tail three-sevenths; upper incisors 2, remote; lower 6; body dark brown above, shoulders black; gray beneath; wings, tail, ears, and snout blackish; eyes under the hair; ears longer than the head, elliptical, auriculated. Length, 3½ inches; breadth, 11 inches.

3. *V. tesselatus.* (Netted Bat.)—Tail half of total length, hairy above; upper incisors 2, remote; lower 6; body fallow above, pale dirty fulvous beneath, with a faint fallow collar; shoulders white; wings hairy at the base, with two hairy white spots above near the thumb; membrane blackish, netted of fulvous internally and clotted of same externally; shafts fulvous; nose bilobate; ears nearly concealed by the hair. Length, 4 inches; breadth, 12 inches.

4. *V. cyanopterus.* (Blue-wing Bat.)—Tail one-third; 2 incisors above, 6 below; body dark gray beneath; wings of a dark bluish gray; shafts black; ears auriculated, longer than the head. Length, 3 inches; breadth, 10 inches.

5. *V. melanotis.* (Black-back Bat.)—Tail one-third above, gray beneath; body blackish above, whitish beneath; wings dark gray; shafts black; ears auriculated, rounded. Length, 4¼ inches; breadth, 12½ inches.

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6. *V. calcaratus.* (Spurred Bat.)—Tail one-third; body dark brown above, dark fallow beneath; wings black; shafts rose-colored, a spur at the inner side of the elbow; hind feet black. Length, 4 inches; breadth, 12 inches.

7. *V. monachus.* (Monk Bat.)—Tail one-fourth, hairy above, fringed laterally; body pale, fallow above and below; head and neck covered with a longer fur of a dark red fallow; wings dark gray; shafts red; hind feet black; nose red; ears concealed in fur. Length, 4 inches; breadth, 12 inches.

8. *V. phaiops.* (Black-faced Bat.)—Tail one-third of total length, naked, mucronate; body dusky bay above, pale beneath; face, ears, and wings blackish; 4 incisors in the upper jaw—2 on each side, divided by a large flat wart, unequal, the outside ones larger and bilobed; 6 small incisors in the lower jaw. Length, 4½ inches; breadth, 13 inches.

9. *V. megalotis.* (Big-eared Bat.)—Tail three-eighths of total length; body dark gray above, pale gray beneath; ears very large, duplicated, auricles nearly as long. Length, 4 inches; breadth, 12 inches.

B.

RAFINESQUE.—Annals of Nature, 1820, 2.

1. N. sp. *Atalapha fuscata.*—Ears longer than the head, auriculated and blackish; tail three-sevenths of total length, jutting only by an obtuse point; body brownish above, grayish beneath; shoulders and cheeks dark brown; hind feet blackish hairy above; wings blackish brown.—Found in the northern parts of New York, and in Vermont. Total length, 3⅛ inches. My genus *Atalapha* (Preces des decouvertes Somoliogiques) contain all the bats without fore teeth; there are three or four species of them in the United States all blended under the name of *Vespertilio* (or *Noctilio*) *noveboracensis* by the writers.

I. N. g. *Eptesicus.*—Four acute fore teeth to the upper jaw, in two equal pairs, separated by a great interval and a large flat wart; each pair has two unequal teeth, the outside tooth is much larger and unequally bifid, inside tooth small and entire; six fore teeth to the lower jaw, equal, very small, close and truncate; canine teeth very sharp, curved and long; grinders unequally trifid; snout plain, nose without appendages; ears separated, auriculated; tail mucronate.—This genus appears to differ from all those of Geoffroy and Cuvier, among the extensive tribe of bats. The name means house-flyer.

2. *Eptisecus melanops.*—Fallowish brown above, pale beneath; face, ears, wings, feet and tail blackish; ears oval, shorter than the head, and wrinkled; tail naked, one-third of total length, mucron one-sixth of the tail; posterior toes ciliate.—Not uncommon in Kentucky, Indiana, &c.

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Total length, 4½ inches. I had noticed it under the head of *V. phaiops*, in the American Magazine, vol. III. It comes often in the house at night.

3. *Eptisecus mydas.*—Fulvous above, gray beneath; wings, ears, and tail pale brown; shafts whitish; ears double the length of head; tail naked, slightly muconate, nearly as long as the body.—I have observed it in the barrens of Kentucky, flying in the houses. Total length three inches, of the tail includes five-twelfths. Ears three-quarters of an inch long. I mentioned it under the name of *V. midas*, in my account of the Bats of the Western States (Ann. Mag. vol. III). I have since substituted two other genera of them, *Hypexodon* and *Nycticejus* (Prod. 70, N. G. An.); the others are probably *Atalaphes*. I know already fifteen species of bats in the United States—almost all new ones.

C.

MAJOR LECONTE.—Cuv. An. Kingdom (McMurtrie's ed.), 431.

I.

Vespertilio carolinensis, GEOF.—Anterior upper fore teeth sub-simple, larger than the posterior. Remarkable for a strong odor resembling that of a fox.

V. lucifugus, L.C.—Anterior upper fore teeth bilobate; body above dark brown, beneath cinereous; nose sub-bilobate; face with a nakedish prominence on each side; ears oblong, naked; tragus sublinear, half as long as the ears; tail projecting a little beyond the membrane. Length, to the insertion of the tail, 2¼ inches; tail 1¼ inches.

V. noctivagans, L.C.—Anterior upper fore teeth bilobate, the posterior sub-simple; color black or dusty cinereous; hair on the back and belly tipped with gray; ears short, naked, roundish; tragus short and roundish; nose sub-bilobate; tail projecting a little beyond the interfemoral membrane, which is hairy. Length, 2⅜ inches; tail, 1⅜ inches.

II.

Add *Plecotus macrotis*, L.C.—Upper fore teeth four, trilobate, distant by pairs, the posterior smaller; ears very long, pointing forwards; tragus subulate, half the length of ears.

III.

Nycticejus noveboracensis.—Easily known by its short and round ears, and by the interfemoral membrane being hairy and including the whole of the tail. There is a white spot at the insertion of the wing, and another at the base of the thumb; these marks are constant. This species varies much in color, and has been called *V. lasiurus*, Schreb., *V. monachus* by some, and is figured in Wils. Orn. VI, pl. 4, whence it has been quoted by M. Cuvier as the *Taphozous*.

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Nyc. crepuscularis, L.C.—Above brown, beneath paler; a small black wart above each eye; nose somewhat bilobate; chin with a small double wart; ears moderate; tragus small, subulate; tail projecting a little beyond the membrane.

Nyc. cynocephala, L.C.—The posterior fore tooth on each side smaller than the rest, which are emarginate; nose furnished on the top and sides with stiff short bristles; lips very large, somewhat pendulous; ears broad, round, naked; tragus not apparent; tail long, extending far beyond the membrane; outer and inner toes of the hind feet woolly on the outside, the rest with each two long hairs on the top.

D.

PALISOT DE BEAUVOIS.—Descriptions of *L. cinereus* and *S. fuscus*, from Pamphlet.

"*Grey Bat.*—Two upper teeth very small, hardly visible. Head whitish; ears round and flat, of a white color surrounded with black, and an appendage at their base; hair grey at the roots, black in the middle, and white at the ends; so that the animal has the appearance of being spotted with white. This hair extends to the membrane which surrounds the tail.

"The anterior parts of the membranous wings from the body of the projecting claw, and covered with hair on both sides. This membrane is about twice the size of that in the preceding species"—(*L. noveboracensis*, Auct.)—"The wings, extended, measure fourteen inches. The nostrils are emarginated.

"Grey Bat. *V. cinereus.*

"This is found in Pennsylvania, and is not described by any author."

"*Brown Bat.*—The two fore teeth in the upper jaw distant from one another, near the canine teeth, and about half their length; ears naked, blackish, and of an oval figure, with an appendage at their base. Tail almost as long as body; flying membrane black; hair brown on the surface, grey below.

"Brown Bat. *V. fuscus.*

"This is the most common species in the neighborhood of Philadelphia. It very much resembles the Common Bat of France, except in the number of teeth in the upper jaw."

E.

TEMMINCK.—Monographie de Mammalogie, II, 1835, 235.

V. ursinus. (A new species kindly furnished me by Prince Max; it is based upon the examination of seven individuals.)—Head large; muzzle rather long, large, and but little depressed; nostrils large, opening upon

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the side and crescentic—separated by a groove. Ears ovoid, much higher than the summit of the head, the posterior border vertical, and slightly emarginated at the tip; tragus long, lanceolate, but a little rounded near the tip; the auricle is hairy at the base of the external part; the thumb stout, armed by a very curved nail; tail long, point free; interfemoral membrane marked beneath with parallel lines; claws of feet very long, stout, and curved. Incisor teeth above in two close pairs; below 6, trilobed. Molars above 4, without false; inferior with 5, one being a small false molar.

Fur long, soft and shining; above of a brown umber hue, the inferior parts more clear. All the fur is gray at the base. Membranes and ear black.

Length, 3 in. 11 lines—the tail taking 1½ inches; length of ear, 4½ lines; expanse of wing membrane, 10 in. 9 lines.

Hab. Found by Prince Max upon the banks of Missouri River.

V. carolinensis.—Not so large as *V. serotinus* of Europe. Ears as long as the head, oblong, and hairy one-half the length of the external part of ears. Nose a little blunt, but nostrils approached; tragus leaf-shaped, erect, and half as long as the auricle; point of the tail free. Incisors 4, in pairs above, and 6 below. Molars 5 throughout.

Fur bicolored throughout; superior part of a brown "marron," but the base of the hair is ashy black; beneath of a yellow ash, the base of the hair being brown.

Total length, 2, 3 or 5 inches, of which the tail constitutes 1 inch; expanse, 10 inches.

Hab. Charleston, S. C.

V. phaiops.—The general contour like that of *V. murinus.* Point of tail free; tail not so long, strongly "sloped" out on external border, with a lobe cut out behind. Tragus an erect leaf. Superior incisors 4; the external are bilobed, and are larger than the internal. Inferior 6. Molars 4 above and 5 below.

Hair short and unicolored throughout, glossy, above brown, with a tinge of red, below it is of clearer hue; face and membranes blackish.

Length, 4 in. 4 lines, or 5 inches—the tail being 2 inches; expanse of wing membrane, 12 to 13 inches; antibrachium, 1 in. 8 lines.

This is the Black-faced Bat of Rafinesque, of which there is mention made in Desm. Mam. in a note.

Hab. N. A.; our animal comes from Tennessee.

V. pulverulentus.—Resembles, in the color of the superior fur, *V. discolor;* but differs from it in its lesser size, in the interfemoral being hairy on both sides, and in the difference of color of the belly. Muzzle large and obtuse; ears larger than high, rounded, one-half haired; tragus hatchet-shaped; tail short; interfemoral very hairy above, but less at the point than at the base, that beneath of a clear "voie," and in concentric lines; the toes furred above.

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Fur long, soft, bicolored throughout, the superior and inferior parts are of the same color. It is of a deep marron, the point only being touched with white, the hairs "clair sermes," arranged in horizontal lines upon the inferior part of the interfemoral membrane, are white.

Length, 3 in. 6 lines, of which the tail is 1 in. 3 lines; expanse, 10 inches; antibrach., 1 in. 6 lines.

This species was furnished us by Prince Max Wied, who obtained it in the mountain recesses of North America. Ours come from the borders of Missouri.

V. caroli.—Tail the form of our *V. pipistrellus*, but the ears are longer. Face obtuse; nostrils very much separated; ears are of medium size, ovoid, slightly emarginate on their external border without having a lobe or prolongation. Upper incisors 4, in pairs above, and 6 below. Molars 6 in all; the two first false molars of the upper jaw very small, short and pointed. Fur bicolored throughout. Face, sides of neck, and all of the superior part of a reddish brown, with black at the base; beneath of a yellowish-white at the point, with a deep brown at base, which in some parts is of a faint yellowish-ash. The young have a more sombre hue. The extreme tip only of the superior parts is brown; that of the inferior is of a deep brown.

Total length, 3 in. 3 lines, the tail of which is 1 in. and 4 lines; expanse of wing membrane, 8 in. 6 lines; antibrachium, 1 in. 4 lines; height of ear from skull to the tip, 5 lines. The young have an expanse of 7 in. 10 lines to 8 inches.

The Museum has obtained from Prince de Musignano—Chas. Bonaparte—many individuals of this species.

Hab. N. America, around the environs of New York and Philadelphia.

V. erythrodactylus.—Less than the *V. pipistrellus*. The forearm, base of fingers, and the interdigital membrane of the first finger is reddish, the other membranes are black. Ears haired from their base the greater portion of their height, small, ovoidal. Tragus subulate; tail very long, point free; interfemoral membrane haired above; beneath the hairs are arranged along the veins; it is of a silky texture, very short, and sparingly distributed. Incisors 4, in pairs above, and 6 below. Five molars in all, only one false molar in the upper jaw.

Fur long, fine and silky; above tricolored, beneath bicolored. All the superior parts of a faint brownish red; but a little yellow about the head and neck; the hairs are black at their base, afterwards yellow and the tip brownish red; superior part of interfemoral membrane very furry; beneath brown at base and brownish red at tip; the sides of the interfemoral covered with sparse hairs.

Length of tail, 2 in. 10 lines, or 3 in. maximum, that of tail 1 in. 4 lines; forearm, 1 in. 2 lines; expanse of wing membrane, 7 in. 6 lines, or 8 in. maximum.

The Museum du Pays Bas possesses many individuals of this supposed

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new species, for which we are indebted to Prince de Musignano; these specimens are preserved in alcohol, and are part of the same invoice as the preceding species. *Vesp. calcaratus*, indicated by M. Rafinesque, has the wing membranes about the fingers red above; but it is much larger, and the coloration of the fur is considerably different.

Hab. North America, about the environs of Philadelphia.

V. ferrugineus.—Style of *V. daubentonii*, of Europe. Nose short, obtuse; ears narrow, a little scooped out on the posterior border and towards the tip; tragus short, subulate. Tail very long, point free, the basal portion covered with hair; the claws of the hind feet are of a whitish yellow. Upper incisors 4, in pairs, internal long "biseam" at point; the external short, bifurcated; inferior incisors 6. Upper molars 4; lower 5, with one false molar.

Hair short, smooth, bicolored; above the color of a dead leaf, or more or less reddish; the base of the hair is of a brownish black beneath; all the hair at its base is of a faint blackish red, and the point pure white. These two hues of the hair form a sort of black and white mixture which is very conspicuous. The membranes of the ears, having been immersed in alcohol, are of a brownish red.

Total length, 4 in., or 2 lines longer, that of the tail 1 in. 9 lines; humerus, 1 in.; forearm, 1 in. 8 lines; anal expanse, 10 in. or 6 lines longer.

This species, based upon the examination of many alcoholic specimens, is new.

Hab. Holland Guiana. (Museum *Pays Bas:* from the environs of Surinam.)

F.

SAY.—Long's Expedition to the Rocky Mts. II, '65, note.

Vespertilio subulatus.—A small bat was shot this evening, during the twilight, as it flew rapidly in various directions over the surface of the creek. It appears to be an immature specimen, as the molars are remarkably long and acute; the canines are very much incurved, and the right inferior one is singularly bifid at tip—the divisions resembling short bristles. This species is, beyond a doubt, distinct from the Carolina Bat (*V. carolinensis*, Geof.), with which the ears are proportionately equally elongated, and, as in that bat, a little ventricose on the anterior edge, so as almost to extend over the eye; but the tragus is much longer, narrower, and more acute, resembling that of *V. emarginatus*, Geof., as well in form as in proportion to the length of the ear. We call it *V. subulatus*, and it may be thus described: Ears longer than broad, nearly as long as the head, hairy on the basal half, a little ventricose on the anterior edge and extending near to the eye; tragus elongated, subulate; the hair above blackish at base, tip dull cinereous; the interfemoral membrane hairy at base, the hairs unicolored, and a few also scattered over its surface, and

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along its edge, as well as that of the brachial membrane; hair beneath black, the tip yellowish-white; hind feet rather long, a few setæ extending over the nails; only a minute portion of the tail protrudes beyond the membrane.

Total length, 2 9-10 inches; tail, 1 1–5 inches.

G.

M. F. CUVIER.[1]—Nouv. Annales du Museum d'Hist. Nat. 1832, 15.

1. *Vespertilio gryphus.*—The head is like that of the *Murinoid* group of bats. To the molars proper of which is united two additional false molars on both sides of either jaw. The ear is emarginated, and the tragus is knife-shaped. All the superior parts of the body are of a whitish yellow, the inferior parts are gray, but the base of the fur on both sides is of a blackish color. Whiskers are present on each side of the upper lip and on the extremity of the lower jaw.

Length of body, from the tip of nose to base of tail, 1 in. 9 lines; length of tail, 1 in. 2 lines; expanse of wing membranes, 7 in. 10 lines.

Hab. Environs of New York. (M. Milbert.)

2. *V. salarii.*—The head is like that of the *Murinoid* group of bats. To the molars proper of which is united the presence of two false molars on both sides of either jaw. The ear is emarginate, and the tragus lanceolate. The superior parts of the body are of a brown chestnut-gray, and the inferior parts a grayish white. There is more of the brown color at the basal portion of the fur than at the upper. Whiskers are present on the sides of the upper lip and at the extremity of the lower jaw.

Length of body, from tip of nose to the base of tail, 1 in. 6 lines; length of tail, 1 in. 7 lines; expanse of wing membranes, 7 in. 7 lines.

Hab. Environs of New York. (M. Milbert.)

3. *V. creeks.*—The head of the *Serotinoid* group of bats. No false molars on upper jaw, and one only inferiorly; the ear is emarginate, the tragus lanceolate; the upper parts are of a brown yellow, the inferior parts of a dirty gray; the hairs of all the parts are black at their base. Whiskers are present on the sides of the muzzle and beneath upon the lower jaw.

Length of body, from tip of nose to the base of the tail, 2 inches; length of tail, 1 inch; expanse of wing membranes, 9 inches.

Hab. Georgia. (Major Leconte.)

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[1] M. Cuvier designated by the term "*Murinoid group*" those species of Cheiroptera since placed under the genus *Vespertilio*. In the "*Serotinoid group*" he placed those species now included in *Scotophilus*. The names are taken respectively from two well known European species—*V. murinus* and *V. serotinus*.

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4. *V. crassus.*—The head is like that of the *Murinoid* group of bats. Two false molars on each side of the two jaws; the ears are obtuse, the tragus is lanceolate. All the superior parts of the body of a brown chestnut-gray, and the inferior parts whitish; the fur at its base is darker tinted than its tips. Moustaches are present on the upper lip and upon the lower jaw.

Length of body, from tip of nose to base of tail, 2 inches; length of tail, 1 in. 8 lines; expanse of wing membranes, 8 in. 8 lines.

This species was collected by M. Leseuer, who sent it from New York, under the name which I have retained.

5. *V. georgianus.*—The head is like that of the *Murinoid* group of bats. The ear is emarginate, and the tragus is subulate. All the superior parts of the body are colored by a mixture of black and whitish yellow; the black mostly, inasmuch as the points of the hair are whitish, the remainder being black. The inferior parts are gray, but mixed with black from the same cause which colors the superior portions. Moustaches are present on the sides of the upper lips and upon the lower jaw.

Length of body, from tip of nose to base of tail, 1 in. 6 lines; length of tail, 1 in. 2 lines; expanse of wing membranes, 7 in. 2 lines.

Hab. Georgia. (Major Leconte.)

6. *V. subflavus.*—The head is like that of the *Murinoid* group of bats. The ear is emarginated, the tragus is half heart-shaped. The inferior parts of the body are of a clear whitish-gray, slightly waved with brown; the superior parts are of a white yellow; the hairs of the superior parts are black at their base, whitish through the greater part of their length, and brownish at their tips; that of the inferior parts are black at their basal portions, and of a whitish yellow at their outer. Moustaches are present on the sides of the upper lip and beneath upon the lower jaw.

Length of body, from tip of nose to the base of the tail, 1 in. 6 lines; length of the tail, 1 in. 3 lines; expanse of wing membranes, 7 in. 2 lines.

Hab. Georgia. (Major Leconte.)

H.

J. J. AUDUBON and the Rev. JOHN BACHMAN, D. D.—Journal Acad. Nat. Sci. Phila. 1842, 280.

Vespertilio monticola. (Mountain Bat.)—V. vespertilione subulata brevior; auriculus brevioribus; tragus non excedentibus, dimidian longitudinem auriculæ; colore fulvo.

Mountain Bat.—Smaller than Say's Bat—("*V. subulatus*")—ears shorter; tragus less than half the length of the ear; color yellowish-brown. Upper fore teeth bilobate; ears moderate, naked, erect, rather broad at base; tragus linear, subulate; body small; wings long; tail projecting a line

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beyond the interfemoral membrane, which is slightly sprinkled with hair above and beneath.

Color.—The nose and chin are black; ears light brown; wing membranes dark brown. The whole of the fur of the body above and beneath is, from the roots, a uniform delicate brown color.

This species differs from Say's Bat, not only in color but in the much shorter ears and tragus. The size and shape of the tragus we have found an invaluable guide in our American bats; the ears of the present species, when alive, are always erect; whilst those of Say's Bat are folded backwards like those of the long-eared bats—*Plecotus.*

Dentition.—Incisors $\frac{2—2}{6}$. Canines $\frac{1—1}{1—1}$.

Dimensions.—Length of head and body, 1 in. 8 lines; length of tail, 1 in. 6 lines; height of ear, 3 lines; height of tragus, $1\frac{1}{4}$ lines.

N. B.—The tragus in Say's Bat is four and a half lines in height. Several specimens of this bat were obtained during the summer, on the mountains of Virginia at the Gray Sulphur Springs. They were uniform in size and color.

V. virginianus. (Virginian Bat.)—V. vespertilione monticola paululum longior, auriculus paululum longioribus magisque acutis; dentibus primoribus maxillæ superioris simplicibus; interfemorali membrana nuda; corpore supra fuligineo-fusco; subtus cinereo-fuscato.

Virginian Bat.—A little larger than the Mountain Bat; ears a little longer and more pointed; upper fore teeth simple; interfemoral membrane naked; sooty brown above, ash brown beneath.

Dentition.—Incisors $\frac{2—2}{6}$. Canines $\frac{1—1}{1—1}$.

In size this species is intermediate between *V. carolinensis* and *V. subulatus.* The ear is naked, less rounded, and more pointed than either of the other closely allied species. The tragus is very narrow, linear, and less than half the length of the ear. The tail is inclosed in the interfemoral membrane, except the penultimate joint, which is free. The anterior upper fore teeth, instead of being sub-simple, as in the *V. carolinensis,* or bilobate, as in *V. subulatus* and *V. montanus,* are simple.

Color.—The nose, upper lip, and upper jaw are black; wings dark brown. The back is sooty brown; on each shoulder, at the insertion of the wing, there is a circular black spot about four lines in diameter; on the under surface cinereous brown.

Dimensions.—Length of head and body, 2 in. 5 lines; length of tail, 1 inch; height of ear, 4 lines; height of tragus, $1\frac{3}{4}$ lines.

Hab. Mountains of Virginia.

V. leibii. (Leib's Bat.)—V. supra fusco-ferrugineus, subtus cinereus, alis auribusque nigris.

Leib's Bat.—Ears and wings black; dark yellowish-brown above; cinereous beneath.

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Description.—Anterior upper fore teeth bilobate; head short; nose blunt; ears moderate, broad at base, erect; tragus nearly linear, nearly half the length of the ear; wings and tail long, the latter extending two lines beyond the interfemoral membrane, which is naked; feet very small; toes short and slender; nails sharp and much curved; hair soft and downy.

Color.—The ears, wings, and interfemoral membrane are black. The fur on the back is black from the roots to near the extremities, where it is so slightly tipt with light brown as to give it a dark yellowish-brown appearance. On the under surface the hairs are plumbeous at the roots, tipt with yellowish-white.

Dentition.—Incisors $\frac{2—2}{6}$. Canines $\frac{1—1}{1—1}$.

Dimensions.—Length of head and body, 1 in. 7 lines; length of tail, 1 in. 4 lines; length of spread, 7 inches; height of ear, 2½ lines; height of tragus, 1 line.

Hab. Michigan.

V. californicus. (Californian Bat.)—V. fusco lutescens, vellere longo et molli; trago longitudine dimidium auris excedente.

Californian Bat.—With long silky hairs; tragus more than half the length of the ear; color light yellowish-brown.

Description.—Anterior upper fore teeth bilobate. Head small; nose sharp; ears of moderate size, erect, rather narrow, and pointed. Tragus linear, attenuated. Wings of moderate length, which, together with the ears, are naked. Interfemoral membrane with a few scattered hairs; feet small; nails slightly hooked. Tail projecting a little beyond the interfemoral membrane.

Color.—Pelage, which is unusually long for the size of the body, and very soft and glossy, is, on the upper surface, dark plumbeous from the base, and broadly tipped with light yellowish-brown; on the under surface the color is a little darker, owing to the outer extremities of the hairs being more narrowly edged with the prevailing color on the back, exhibiting the darker shades beneath. The ears and tragus are blackish; the nose, chin, wings, and interfemoral membrane dark brown.

Hab.—We have obtained but a single specimen, which was captured at California.

Dentition.—Incisors $\frac{2—2}{6}$. Canines $\frac{1—1}{1—1}$.

Dimensions.—Length of head and body, 1 in. 7 lines; length of tail, 1 in. 5 lines; length of spread, 7 in. 6 lines; height of ear, 3 lines; height of tragus, 2 lines.

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I.

PRINCE MAXIMIL. VON WIED.—Verzeich. beobach. Säugethiere in Nord Amerika, 1862, 19.

Vespertilio brevirostris.—Description: Head very short; snout broad, and but little produced; ear tolerably high, rather elliptical, the anterior border somewhat rounded, the outer nearly straight, under the tip slightly emarginated; tragus rather small, nearly lancet-shaped; the fur about the head very plentiful, so that the eyes are entirely hidden.

Dentition.—The specimen of this bat is lost, so I cannot therefore furnish the dentition.

The expansion of the wings rather small. Thumbs long and small, with greatly curved nails. Tail somewhat long, eight or nine joints lying on the outer half of the fur of the interfemoral membrane, the tip, however, is one and a half to two lines long, with the free points exserted; the five hind toes are long, the nails weak, and sharply curved; calcaneum rather long; fur thick about the belly, mouse-like, that of the back longer; wing membranes near the body are somewhat furred.

Coloration.—Expansion of wing membranes and ears are dark brown; upper portion of the body dark yellowish-brown, the hair on the outer half fallow yellowish-brown, dark gray at the roots; under portion whitish yellow-gray.

Measurements.—Entire length, 3 inches; expanse of wing membrane, 9 in. 4 lines; height of ears on the upper side 5½ lines; length of the exposed portion of the tragus, 1⅓ lines; the tail is free from the fur about 1 in. 5 lines; length of calcaneum, 5 lines.

I obtained this bat at Freiburg, Pennsylvania, about the latter part of July. It flies about rather early in the morning. We have observed that this bat resembles the other species closely, but it is readily distinguished by the shortness of the head, as the name given to it implies.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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LAND AND FRESH WATER SHELLS

OF

NORTH AMERICA.

PART II.

PULMONATA LIMNOPHILA AND THALASSOPHILA.

BY

W. G. BINNEY.

WASHINGTON:
SMITHSONIAN INSTITUTION.
SEPTEMBER, 1865.

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PREFACE.

THE *Pulmonata* are usually divided into *Geophila*, *Limnophila*, and *Thalassophila*, according as their habits are terrestrial, fluviatile, or marine. The first division is included in the Land and Fresh-Water Shells, Part I, now ready for the press. The second and third divisions form the subject of the present volume.

The descriptions of the family *Auriculidæ* have already been published in the fourth volume of The Terrestrial Mollusks of the United States. In the other families I have adopted the plan of giving the original description, or an English translation of it, and a fac-simile of the original figure not only of each species, but also of all those I have considered synonyms. I have thus placed within the reach of every American student all the materials for a complete monograph of the *Lymnæidæ*, &c., of North America which can be obtained from books. The other, more important, source of knowledge of the subject can be gained only by gathering together from every part of the country large suites of specimens, fairly representing each species. Not until this is done can their characters be described, and information given of their variation, their geographical distribution, and their relations to each other.

Though not competent to prepare a monograph all whose decisions may be considered final, it has been easy in numerous cases to refer supposed new species to those previously described. These instances arise from ignorance on the part of one author of the labors of those preceding him, or in his exaggeration of variations which to me have appeared too slight to denote specific difference. The repetition of the original description and figure of each of these synonyms will enable the student to judge for himself of the correctness of my decisions.

The Museum Register printed after the description of each species will show how large a collection of specimens I have had

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before me belonging to the Smithsonian Institution. In addition to these I have had the opportunity of studying all the original specimens of Mr. Say, Prof. Haldeman, Dr. Gould, Mr. Lea, the Academy of Sciences of Philadelphia, the Museum of Comparative Zoology at Cambridge. I have received also typical specimens from almost all those who have described species, and corresponded so generally on the subject, that were I to specify those to whom I am indebted for information, the list would contain the name of nearly every living American conchologist.

The descriptions of orders, families, genera, and subgenera are principally copied from "The Genera of Recent Mollusca."

The subject is brought down to January, 1864.

All the original figures of shells and lingual dentition were drawn by Mr. E. S. Morse, of Gorham, Maine.

W. G. BINNEY.

BURLINGTON, N. J., August, 1865

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LAND AND FRESH-WATER SHELLS

OF

NORTH AMERICA.

II.

PULMONATA.

Suborder LIMNOPHILA.

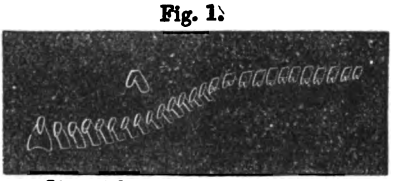
Eyes sessile; tentacles subcylindrical or flattened, simply contractile. Operculum wanting. Animal usually lacustrine or fluviatile, sometimes marine or littoral, rarely terrestrial.

All the known families of *Limnophila* are represented in this country. Their habits are described under each.

Family AURICULIDÆ.

Lingual membrane broad and elongated; teeth numerous, in slightly bent, cross series; central tooth equilateral; lateral

Fig. 1.



Lingual dentition of *Alexia myosotis*.

teeth rather inequilateral, diminishing in size towards the outer edge. Head ending in a snout; mouth with a horny lunate upper jaw,[1] and with two dilated buccal lobes, united

[1] See *Alexia myosotis*, p. 4.

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above, separated below; tentacles subcylindrical, contractile; eyes sessile at the inner sides of the bases. Mantle closed, with a thickened margin; foot long, posteriorly blunt; respiratory orifice posterior, on the right side, excretory orifice near it. Sexes united, orifices of generative organs distant, on the right side.

Shell spiral, covered with a horny epidermis; aperture elongate, with strong folds on the inner lip; outer lip often dentate.

Animal usually frequenting salt marshes.

The *Auriculidæ* are easily distinguished from the other inoperculated air-breathing Mollusks. They are furnished with but one pair of non-retractile tentacles, on the inner base of which are situated the sessile eyes. The head is extended beyond the tentacles into an obtuse, rounded, bilobed snout. The mantle is thin, thickened on its margin. The foot is elongated and pointed. The sexes are united in each individual.

The shell is spiral, extremely variable, and in the American species conic, generally with a flattened spire, and furnished with numerous tooth-like laminæ, which contract the narrow aperture. The internal septa are usually removed.

The *Auriculidæ* are amphibious Mollusks, breathing free air, but apparently dependent for existence on a great deal of moisture, if not on the actual vicinity of the sea. Some species pass their whole life under circumstances which seem to preclude the possibility of their respiring air. Thus *Alexia myosotis* is often found on isolated stones in salt marshes, which are entirely covered by the tide four hours out of twelve. This species, when immersed in fresh water, becomes benumbed and soon dies.

Carychium exiguum, on the other hand, though found under similar circumstances, does not depend on the proximity to salt water, being widely distributed far beyond its influence over the interior of the country. *Blauneria pellucida*, also, has been detected living far from any water in a garden in the District of Columbia, whither it was introduced on plants from Charleston, S. C. With the exception of the two last mentioned, the American species are found on salt marshes and in brackish water near the sea.

Of the geographical distribution of our species but little is yet known. *Melampus bidentatus* is found from Maine to Texas.

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Melampus obliquus is referred by Say to South Carolina. *Alexia myosotis* was probably introduced from Europe; I have never known of its being found south of New York harbor. *Carychium exiguum* will probably be found in all the States. The other species are confined to the coast of Florida and the Gulf of Mexico, some of them being common to Cuba and other West Indian Islands.

There are several genera of *Auriculidæ* not represented in this country, some attaining a large size, and with more brilliant coloring than our plain species, such as *Pythia, Cassidula, Auricula*, &c. They are widely distributed over the globe, reaching the greatest perfection in the Pacific Islands.

The family has been subdivided into *Auriculinæ* and *Melampinæ*, characterized by the comparative thickening or expansion of the outer lip.

Subfamily AURICULINÆ.

Animal terrestrial, living chiefly on the land. Tentacles developed. Shell with the inner lip plicate; outer lip thickened or expanded.

AURICULA, Lamarck.

No species of this genus, as now restricted, is found in the United States. The following list contains all the species described as *Auriculæ*, and the position in which they are now classed.

Spurious Species.

Auricula bidentata, Gld. &c., is the same as *Melampus*.
Auricula biplicata, Desh., is the same as *Melampus bidentatus*.
Auricula cingulata, Pf. &c., is the same as *Tralia*.
Auricula cornea, Desh., is the same as *Melampus bidentatus*.
Auricula denticulata, Gld., Dek., is the same as *Alexia myosotis*.
Auricula floridana, Shuttl., is the same as *Tralia*.
Auricula jaumei, Mittre, is the same as *Melampus bidentatus*.
Auricula obliqua, Dek., is the same as *Melampus obliquus*.
Auricula sayii, Küster, is the same as *Leuconia sayii*.
Auricula stenostoma, Küster, is the same as *Tralia cingulata*.
Auricula bidens, Say of Pot. et Mich. Mr. Say never described any such species.

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ALEXIA, (LEACH), GRAY.

Fig. 2.

Animal of *Alexia myosotis*.

Foot simple beneath, without a transverse groove.

Fig. 3.

Jaw of *Alexia myosotis*.[1]

Jaw narrow, slightly arcuate, extremities but little attenuated, striæ obsolete, scarcely any median projection. Lingual dentition, see p. 1, Fig. 1.

Shell oblong-ovate, thin, spire pointed; last whirl large, rounded at base; aperture rather broad, oval, acuminating; parietal wall furnished with from one to five tuberculous laminæ; columellar fold oblique; peristome expanded, armed with teeth, or thickened within.

But one species is known to inhabit North America. Most of the few foreign species inhabit the coasts of the Mediterranean, though the genus is represented in South America and the West Indies.

Alexia myosotis, DRAPARNAUD.—Shell elongate-oval, thin, semi-transparent, smooth and shining; dark horn-color, with a narrow reddish sutural line; spire produced with an acute apex; suture distinctly impressed; whirls from seven to eight, the upper ones rather convex, the last one elliptically ovate, equalling five-sevenths of the shell's length; aperture subvertical, about four-sevenths the length of the shell; peristome somewhat expanded and thickened, sometimes furnished with tooth-like folds on its inner side; its basal termination appressed to the shell, slightly reflected over a minute perforation, and turning upwards till it blends with the columellar fold, which winds into the aperture; the parietal wall is furnished with a white, transverse, thin, and sharp denticle, and a second smaller, much less prominent one, placed above it. Greatest diameter 4, length 8 millimetres.

Fig. 4.

Alexia myosotis.

Auricula myosotis, DRAPARNAUD, &c.

Auricula denticulata, GOULD, Invert. of Mass. 199, f. 129 (excl. *Voluta denticulata*, MONT. et syn. suis.) (1841), not of MONTFORT.

[1] From Moquin-Tandon.

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Auricula denticulata, DEKAY, N. Y. Moll. 58, pl. v, f. 91, 93 (excl. *Voluta denticulata*, MONT. et syn.), nec MONTFORT.

Melampus borealis, CONRAD, Am. Journ. Sc. [2], XXIII, 345 (1833).

Alexia myosotis, PFEIFFER, Mon. Auric. Viv. 148; Brit. Mus. Auric. 114. —W. G. BINNEY, T. M. IV, 172, pl. lxxv, f. 33; pl. lxxix, f. 16.

Carychium (*Phytia*) *myosotis*, MOQUIN-TANDON, Moll. Fr. II, 417, pl. xxix, f. 33–39; pl. xxx, f. 1–4.

Conovulus myosotis, REEVE, Br. L. & Fr. W. Sh. 130 (1864).

Animal short, about one-half the length of the shell, dirty white, darker on the head and tentacles; eyes black, placed at the inner base of the feelers; feelers quite short, wrinkled, bulbous at tip, sufficiently dark to be visible through the thin shell when the animal withdraws itself; head continued beyond the tentaculæ into an obtuse, short, bilobed snout; the shell is carried horizontally on the animal's back; the obtusely pointed posterior termination of the foot is just visible beyond the shell; the animal is sluggish in its movements. (See p. 4, Fig. 2.)

Jaw. (See p. 4, Fig. 2.)

Lingual dentition. (See p. 1, Fig. 1.)

I have received specimens of this species from Nova Scotia to Rhode Island. It is also a well-known inhabitant of parts of the coasts of England, France, Spain, &c.

I have placed this shell in this genus on the authority of Pfeiffer and of Adams' genera. It has been placed in many different genera by European authors. In America it has been considered an *Auricula* by Gould and others, until Stimpson classed it among the *Melampi*. From the exterior of the animal there appears no difference between it and *Melampus bidentatus*. It does not even agree with the animal of *Alexia*, given by Adams in the Genera of Recent Mollusca, which I have copied on pl. 75, fig. 22, of The Terrestrial Mollusks. This figure represents the true *Alexia denticulata*, Montfort, with which Gould confounds this species. The shell is also quite distinct. It is, however, united to *Alexia myosotis*, by Forbes and Hanley, in their work on British Mollusca, and by Moquin-Tandon. Pfeiffer considers them distinct, as does also Reeve.

It is probably an imported species, as Stimpson remarks (Sh. of New Eng.), being found only in the Atlantic seaports. At Boston it is common on old wooden wharves in the harbor. It is also found on isolated stones which are immersed by the rising tide at least four hours out of the twelve. When placed in

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fresh water it becomes benumbed and dies; it will live without water in captivity several days.

There can be no doubt of *M. borealis*, Conrad, being identical with this species. Conrad's description is given below.

Melampus borealis.—Shell ovate-acute, elongated; pale horn-color, with darker longitudinal bands; whirls six or seven, with a revolving impressed line below the suture; spire elevated, conical; columella with three distant and distinct plaits, the middle one most prominent; aperture obovate-acute. Length about one-fourth of an inch.

This small species of *Melampus* has been found sparingly on the coast of Rhode Island, by Lieut. Brown, of Newport. It is similar in form to a *Bulimus*, and is very unlike the common species with which it associates. (*Conrad.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8743	4	Massachusetts.	W. G. Binney.	Cabinet series.
8799	12	"	W. Stimpson.	.....

CARYCHIUM, Müller.

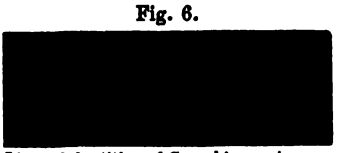
Fig. 5.

Carychium exiguum.

Foot not transversely divided beneath.

Shell pupa-shaped, very thin, transparent, with but few whirls; aperture suboval; with one dentiform columellar fold, sometimes obsolete; parietal wall with 1 or 2 teeth; peristome expanded, terminations not approximating, the right hand one with one internal tooth.

Fig. 6.



Lingual dentition of *Carychium exiguum.*

Jaw slightly arched, without ribs or marginal denticulations, hardly striated towards the margin.

Teeth in slightly bent cross series, central equilateral, narrow, laterals broad, short, denticulated.

But very few species of this genus have been described, most of which are from Europe. Animal terrestrial.

Carychium exiguum, Say.—Shell elongated, tapering at both ends, white, translucent, shining; apex rather obtuse; whirls five to six,

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convex, very oblique, with transverse striæ; suture distinct, impressed; aperture obliquely oval, white, with a prominent plait on the columellar margin, about midway between the extremities of the lip, and a slightly prominent fold near the junction of the lip with the umbilical extremity of the shell; lip thick, reflected, flattened; umbilicus perforated. Length $1\frac{3}{5}$, diam. $\frac{3}{4}$ mill. Aperture $\frac{1}{2}$ mill. long.

Fig. 7.

Carychium exiguum.

Fig. 8.

Carychium exiguum, greatly enlarged.

Pupa exigua, Say, Journ. Acad. II, 375 (1822); ed. Binney, 26.—Gould, Bost. Journ. III, 398, pl. iii, f. 20 (1841); IV, 358 (1843); Invertebrata, 191, f. 122 (1841).—DeKay, New York Fauna, 49, pl. iv, f. 46 (1843).—Adams, Vermont Mollusca, 158, fig. (1842).

Bulimus exiguus, Binney, Terr. Moll. II, 286, pl. liii, f. 1.

Carychium exiguum, Gould, in Terr. Moll. II, 286.—Chemnitz, ed. 2, 61, pl. i, f. 13, 14.—Pfeiffer, Mon. Auric. 165; Brit. Mus. Auric, 127; Wiegm. Arch. 1841, I, 224.—W. G. Binney. T. M. IV, 178.—Fraudenfeld (1847), Akad. der Wiss. XIX, 79; Zool. Bot. Wien. IV, 10, pl. 1, f. 1 (1854).—Bourguignat, Mag. Zool. 1857, 209.

Carychium exile, H. C. Lea, Am. Journ. Sc. [1], XLII, 109, pl. i, f. 5 (1841).—Troschel, Ar. f. Nat. II, 128 (1843).

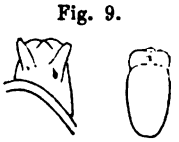
Carychium existelium, Bourguignat, *l. c.* 220.

Carychium euphœum, Bourguignat, *l. c.* 221.

Has been found in the New England, Northern and Middle States, in South Carolina, Arkansas, and Texas.

Animal colorless; tentacles stout, hyaline, one-third the length of the foot. The foot is short, thick, distinctly divided into two segments.[1] the anterior of which is bilobed, and projects, when the animal is in motion, considerably in advance of the head. Eyes oval, situated on the back, near the base of the tentacles. Its motions are very sluggish. It carries the shell directed horizontally; the shell is so transparent that the viscera of the animal may be seen through it.

Fig. 9.



Carychium exiguum.

It has been said to resemble *Carychium minimum*, of Müller, but neither the figure nor description, as given by Draparnaud, correspond with our shell.

It is found under stones and fragments of wood, and especially among moss, in damp places. It is the only species of this

[1] This does not agree with the generic description of *Carychium*.

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family inhabiting the interior, but though found over a wide extent of country, it still possesses a fondness for the sea in common with the other species of the family. Around Boston it is found at or below the surface in swamps, growing among mosses.

This minute shell is well known in American cabinets as a *Pupa*. Say described it as such in 1822, though he mentions the probability of its being a *Carychium*. It has been described since that time as a *Pupa* by Gould, DeKay, and Adams, and catalogued among the species of the same genus by all the American writers who have mentioned it, until 1851, when its correct position was pointed out by Stimpson (Shells of New England) and Gould (Terr. Moll. II). The former places it in his family of *Melampidæ*.

Dr. Binney, in 1843 (Boston Journal, p. 106), considers it a *Pupa*. In the Terrestrial Mollusks he places it under *Bulimus*.

In 1852, Jay removed it from *Pupa* to *Carychium* (Cat. p. 263).

Notwithstanding its distinct generic peculiarities having been pointed out in 1851, we find the shell considered as a *Pupa* in several American catalogues as late even as 1857 (*vide* Boston Proc. VI, 128).

In Europe we find its true position pointed out by Pfeiffer as early as 1841, and by all subsequent writers.

In the fourth volume of the Terrestrial Mollusks I have given copies of the original descriptions of this species, and a figure of *C. exile*.

Lingual dentition (see p. 6).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8440	7	.....	.....	.....

Spurious Species.

Carychium armigera, *contracta*, and *rupicola*, of Say, and *C. corticaria*, of Ferussac (Tabl. Syst.), are species of *Pupa*.

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Subfamily MELAMPINÆ.

Animal amphibious, or living in brackish water. Shell with the inner lip plicate; outer lip straight and acute.

MELAMPUS, Montf.

Foot bifid posteriorly. Shell ovate-conical; spire short, obtuse; aperture narrow, linear; inner lip with several transverse folds; outer lip acute, internally plicate.

Jaw —?

Lingual membrane —?

Numerous species of this genus have been met with, widely distributed over the world.

Melampus olivaceus, Cpr.—Shell small, rather smooth, conical; spire depressed, obtusely angulated below the suture, which does not distinctly separate the whirls; color dirty white, with irregular patches or revolving lines of dark red or purplish; epidermis olive-colored; on young or very fresh specimens there are sometimes microscopic revolving lines near the base of the shell, and on the spire, which cross the delicate lines of growth so as to present under the microscope a granulated surface; whirls seven to nine, the upper ones distinguished only by means of the lens, and flattened; aperture long, equalling $\frac{1}{2}$ of the shell, edge variegated in color by the termination of the reddish bands on the white ground of the shell, within white; the outer lip is furnished with numerous sharp, white laminæ, in the specimens before me varying from 1 to 9; the parietal wall of the aperture is covered with an almost imperceptible shining, callus; there is one constant, prominent, elevated white tooth-like lamina revolving within the shell, which is usually placed within two smaller shorter ones; on the columella there is also a stouter lamina entering into the aperture, and passing outwards and curving downwards so as to join the termination of the labium. Length 13, diam. 18 mill.

Fig. 10.

Melampus olivaceus.

Melampus olivaceus, Carpenter, in Reigen Cat. of British Museum, 178 (1856).—W. G. Binney, T. M. U. S. IV, 27, pl. lxxix, f. 8.

San Diego to Mazatlan (Reigen Cat.).

This is the first species of the family *Auriculacea* found on the Pacific coast of North America. There were numerous specimens found by M. Reigen, which Mr. Carpenter describes as dis-

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tinguished generally by the olive-green epidermis, variegated with purplish-brown patches. I find the number of laminæ in the aperture very variable, but the two prominent ones on the labium are constant in all the individuals I have had the opportunity of examining.

The figure is taken from a specimen received from Mr. Carpenter.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8366	1	W. Coast.	.....	.....
3414	9	"	.....	.....
8550	3	"	.....	Cabinet series.

Melampus bidentatus, Say.—Shell imperforate, elliptically-ovate, rather thin, shining when perfect, but usually found much eroded; the surface is marked with longitudinal wrinkles, and very minute revolving striæ; horn-color, or grayish-red, often with revolving, narrow rufous bands, four or five in number; suture well marked; spire short, and usually obtuse, often somewhat eroded; whirls usually six, the upper ones flattened, the body whirl equalling about $\frac{2}{3}$ of the entire length of the shell, and obtusely angulated at its greatest width; aperture hardly oblique, very long and narrow, enlarging gradually towards the base, about $\frac{2}{3}$ the length of the shell; peristome very thin and sharp, not reflected, on the interior furnished with no laminæ, or with from one to seven; these laminæ are elongated, white, and do not reach the margin; they are usually separate, placed at irregular intervals, but sometimes are found on a longitudinal elevated, white callus; they enter but a short distance into the aperture; the parietal wall of the aperture is covered with a thin, shining, enamel-like callus, and bears on its lower half a single, white, prominent and transverse tooth, entering into the aperture; the columellar is also furnished with a white, tooth-like fold, commencing at the termination of the sharp peristome, and revolving upwards into the interior of the shell; this fold does not extend far into the aperture, as all the internal whirls and axis of the shell are early absorbed by the animal.

Fig. 11.

Melampus bidentatus.

Fig. 12.

Melampus bidentatus.

Length of an unusually large individual 13, breadth 7 millimetres.

Melampus bidentatus, Say, Journ. Acad. Nat. Sc. Phila. II, 245 (1822); Binney's ed. 84.—Russell, Journ. Essex Co. Nat. Hist. Soc. I, part 2, 67 (1839).—Pfeiffer, Mon. Auric. Viv. 45 (excl. *Mel. borealis*).—W. G. Binney, T. M. IV, 156, pl. lxxv, f. 23.

Melampus biplicatus, Pfeiffer, Mon. Auric. Viv. 21; Br. Mus. 14.

Melampus? jaumei, Pfeiffer, Mon. Auric. Viv. 25; Brit. Mus. Cat. 18.

Auricula cornea, Deshayes, Encycl. Méth. II, 90 (1830); Ib. in Lam. ed. 2, VIII, 339; ed. 3, III, 390 (1839).

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Auricula bidentata, GOULD, Inv. Mass. 197, f. 131 (1841).—DEKAY, N. Y. Moll. 57, t. v, f. 92, 1, 2, 3 (1843).—KÜSTER, Chemn. ed. 2, Auric. 41, pl. vi, f. 7–11.

Not *Auricula bidens*, POTIEZ et MICHAUD, Gal. 201, pl. xx, f. 9, 10.

Auricula jaumei, MITTRE, Rev. Zool. (Mars, 1841), 66.

Auricula biplicata, DESHAYES, Encycl. Méth. II, 91.

Melampus bidentatus, var. *lineatus*, SAY, p 46 of ed. BINNEY.

Melampus bidentatus, β, PFEIFFER, Mon. Auric. 46.—Var. a. DEKAY, *l. c.*

Along the whole coast from New England[1] to Texas. A very common shell among the grass of salt marshes near high water mark.

Animal about as long as the shell, and the foot is transversely bifid; tentacula somewhat wrinkled, cylindrical, rather smaller towards the tips, which are obtuse or rounded; eyes placed at the inner base of the tentacula; rostrum somewhat wrinkled, nearly as long as the tentacula, bilobate before; foot, anterior segment emarginate behind, posterior segment bifid at the extremity; all above, with the exception of the tentacula and rostrum, glabrous, reddish-brown, beneath paler. (*Say.*)

The shell when young is quite pretty, being shining and often variegated by the revolving bands. But few mature shells are met with in a perfect condition. They are usually much eroded. From the toothless outer lip to that bearing a heavy callus ridged with transverse laminæ, every intermediate variety is found. The absence of the laminæ is equally common in mature and young shells.

Authentic specimens of this species are still preserved in the collection of the Academy of Natural Sciences of Philadelphia.

The original descriptions of Mittre and Deshayes are given in Terr. Moll. IV. I have seen authentic specimens of neither of their shells. The descriptions are merely copied by Pfeiffer, in the works referred to in the synonymy.

Say designates by the name of *lineatus*, a form peculiar for its revolving lines or bands and more narrow base of the aperture (*vide* Binn. ed. p. 85). I have met with none sufficiently marked to form a variety, much less a distinct species. The revolving

[1] Gould mentions its being said to have been found living with a *Planorbis* at Windsor, Vt. If so, it must be adapted to a remarkable difference of station, being usually found near the sea. Pfeiffer also gives Vermont as the habitat, probably on the above authority.

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lines are commonly found on young specimens. DeKay mentions this as var. α, Pfeiffer as β. The latter author also describes a var. γ :—

Fig. 13.

M. bidentatus, var. *lineatus*.

Last whirl sub-excavated below the suture, minutely spirally striated; lip with a white ridge of callus within the dark-colored margin, with from 6–10 regular folds.

Georgia. (*Pfeiffer.*)

He quotes in the synonymy of this variety *Mel. borealis*, Conrad, of Cuming's collection. Conrad's species is much more likely to be *Alexia myosotis* than any variety of *Mel. bidentatus*.

Potiez & Michaud describe and figure quite a distinct shell under the name of *Auricula bidens*, Say.

Stimpson gives precedence to Deshayes's name *corneus*. Say's name has eight years' priority, and is not pre-occupied in the genus *Melampus*. It was while treated as an *Auricula* that any question existed in regard to its specific name.

Pl. 75, Fig. 23, of the Terrestrial Mollusks, IV., represents a specimen not furnished with laminæ within the peristome.

The date of publication of this species is erroneously quoted by Pfeiffer as 1821. The title-page of the first part of Vol. II of the Academy Proceedings bears this date. The description was actually published at the date given by me.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8436	8	Georgia.	Dr. J. Lewis.	.....
8437	8	Indianola, Tex.	G. Wurdemann.	.....
8438	12	Charleston, S. C.	Lieut. Kurtz.	.....
8439	10	Indianola, Tex.	.....	.....
8441	3	Charleston, S. C.	Lieut. Kurtz.	.....
8800	20+	St. Simon's Island, Ga.	.....	.....
8801	100?	Massachusetts.	W. Stimpson.	.....
8804	5	Key West.	.....	.....
8822	11	Indian Key, Fla.	G. Wurdemann.	.... .
8823	3	Texas.	Capt. Pope.	.....

Fig. 14.

Melampus flavus, twice natural size.

Melampus flavus, Gmel.—Shell imperforate, obconic, smooth, chestnut-colored, with three light, narrow bands; spire short, convex conic; suture slightly impressed; whirls from nine to ten, the upper ones flattened, the last about equalling three-fourths of the length of the shell, arcuately ridged below; aperture subvertical, narrow, angulated below; one deep parietal fold, one subvertical, stout, columellar fold, extended towards the base; peristome straight, acute, its outer margin reddish, thickened with white within and fur-

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nished with ten short, transverse ribs, its columellar portion expanding and callous. Length 12, breadth 8⅔; length of aperture 9½, breadth at the middle 3 millimetres.

Lister, Hist. t. dcccxxxiv, f. 60.—Favanne, Conch. t. lxv, f. H, i.
Auricula midæ parva, &c., Mart. & Chemn. II, 119, 126, t. xliii, f. 445.
Voluta, n. 106, Schröter, Einl. I, 272.
Voluta flava, Gmelin, Syst. 3436, No. 5.—Dillwyn, Cat. I, 506, n. 17.
Voluta flammea, γ, Gmelin, *l. c.* 3435, n. i.
Bulimus monile, Bruguiere, Encycl. Méth. I, 338, n. 70.
Melampa monile, Schweigger, Handb. 739.
Conovulus monile, Goldfus, Hand. 657.
Conovulus flavus, Anton, Verz. 1776.
Auricula monile, Ferussac, Podr. 105.—Lamarck, An. sans Vert. VI, 2, 141; ed. Desh. VIII, 333.—Küster in Chemn. ed. 2, Auric. 30, pl. iv, f. 7–9.
Auricula flava, Deshayes in Lam. VIII, 33.—Petit, Journ. Conch. II, 427 (1851).
Auricula coniformis, Orbigny, Moll. Cuba.
Melampus monile, Lowe, Zool. Journ. V, 292.
Melampus flavus, Adams, Contr. 42, 186.—Poey, Mem. I, 394.—Pfeiffer, Mon. Auric. Viv. 21; Brit. Mus. Auric. 14.—W. G. Binney, T. M. IV, 186, wood-cut.
Melampus torosa, Mörch, Cat. Yoldi, 38.
Melampus monilis, Shuttleworth, Diag. 7, 162.

A West Indian species, found in Florida by Mr. Bartlett.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8542	1	Florida.	W. G. Binney.	Cabinet series.

Melampus coffea, Lin.—Shell imperforate, cone-shaped, very solid and heavy, smooth and shining in fresh specimens, with delicate wrinkles of growth, and very numerous microscopic revolving lines; light fawn-color when deprived of its russet epidermis, with three or four revolving bands of white on the body whirl, of which the uppermost is broadest; suture moderate; spire short, conic, apex black, shining, pointed; whirls from nine to ten, the upper ones flattened, the last obtusely angulated below the suture, ⅞ the length of the entire shell; aperture subvertical, long and narrow, gradually widening towards the base of the shell, about ⅝ the entire length of the shell; peristome acute, not reflected, but thickened within by a heavy white callus, extending as high up as the carina of the body whirl; on this callus are from fifteen to twenty-two white, transverse laminæ or ridges, not reaching the edge of the peristome, and not

Fig. 15.

Melampus coffeus, natural size.

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entering far into the aperture; sometimes there is a second and even third series of these laminæ visible within the aperture; on the parietal wall are two elevated, white, entering folds, the upper one much more prominent; the columella is covered with a shining, brown callosity, and furnished with one rather prominent fold, which commences at the termination of the peristome, and winds upwards into the interior of the shell; the interior whirls and axis are entirely absorbed. Diameter of a large specimen, 10, length 19 diameters.

Bulla coffea, LINNÆUS, Syst. Nat. X, 729.

Voluta coffea, LINNÆUS, Syst. Nat. XII, 1187.—SCHRÖTER, Einleit. II, 200.—GMELIN, Syst. Nat. XIII, 3438.—DILLWYN, Descr. Cat. I, 506.

Voluta minuta, GMELIN, Syst. 3436, ex parte.—DILLWYN, *l. c.* 506.

Auricula midæ parva, fusca, albo-fasciata, MARTINI et CHEMNITZ, II, 119, pl. xliii, f. 445? (or *Mel. flavus?*).

Ellobium barbadense, BOLTEN, Mus. 106, ed. nov. p. 74?

Bulimus coniformis, BRUGUIERE, Encycl. Méth. I, 339.

Melampus coniformis, MONTFORT, Conch. Syst. II, 318.—LOWE, Zool. Journ. V, 292.

Melampus coffeus, ADAMS, Gen. Rec. Moll. t. lxxxii, f. 7, 7*a* (no desc.).—PFEIFFER, Mon. Aur. 28; Br. Mus. Cat. 19.—W. G. BINNEY, T. M. IV, 162, pl. lxxv, f. 21, 25.

Melampa minuta, SCHWEIGGER, Handb. 739.

Tornatelle coniforme, BLAINVILLE, Dict. Sc. Nat. pl. Malac. liv, f. 4.

Auricula coniformis, LAMARCK, Hist. an. s. Vert. VI.—DESHAYES in Lam. VIII, 332; ed. 3, III, 387.—POTIEZ et MICHAUD, Gal. I, 202.—REEVE, Conch. Syst. II, t. clxxxvii, f. 7 (teste PFR.).—SOWERBY, Conch. Man. 77, f. 298?—CHEMNITZ, ed. 2; Auric. 31, t. iv, f. 14–17.

Auricula ovula, ORBIGNY, Moll. Cub. I, 187, t. xiii, f. 4–7 (1853).

Conovulus coniformis, LAMARCK, Encycl. Méth. t. cccclix, f. 2 (no desc.).—WOODWARD, Man. Moll. 173 t. xii, f. 37 (1854).

The only specimens I have seen were collected in Florida, by Mr. Bartlett, more than ten years ago. It is a well known and very common shell in the West Indies. Referred also to Mexico by Pfeiffer.

Mr. Thomson sent me specimens from New Bedford, where they were probably introduced by the schooners of the live-oak trade running to Florida.

Animal (see T. M. U. S. IV, pl. 75, fig. 21) about the length of the shell; tentacles short, pointed, eyes at their interior base; proboscis extending beyond the head, bilobate, bluntly terminating; posterior termination of the foot short, bifid, color dark-brown.

Figure 25 of plate 75, of Terr. Moll. IV, is a fac-simile of

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Orbigny's figure of *Auricula ovula*. It is a good representation of our Florida shells.

West Indian specimens are well known in cabinets. I know of no American specimens, with the exception of the few collected by Mr. Bartlett.

Plate 79, fig. 6, of T. M. IV, may represent a variety of this species. It is from Texas.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8821	5	Indian Key, Fla.	G. Wurdemann.	Cab. ser. Var. and sp. dist.? *Vide* T. M. IV.
8824	1	Texas.	Capt. Pope.	Cab. ser. Var. and sp. dist.? *Vide* T. M. IV.

SPURIOUS SPECIES OF MELAMPUS.

Melampus borealis, CONRAD, I have referred to *Alexia myosotis*.

Melampus denticulatus, STIMPSON, is also identical with *Alexia myosotis*.

Melampus redfieldi, PFR. (See T. M. IV, 170.)

Melampus pusillus, floridanus, and *cingulatus* (see *Tralia*).

Melampus obliquus, SAY.—Obconic, reddish brown, rather thick; spire very little elevated; whirls eight or nine, wrinkled across; labium with two very distinct teeth, and an intermediate and equidistant, slight obtuse prominence; inferior tooth very oblique, terminating at the base; labrum with about eight teeth or striæ, which terminate on the margin; base of the aperture a little contracted by the basal tooth. Length more than seven-twentieths of an inch.

I am indebted to Mr. Stephen Elliott for this species, who obtained it on the coast of South Carolina. It is closely allied to *Bulimus monile*, Brug., but it has no appearance of bands, which distinguish that shell. In the collection of the Academy are specimens from the West Indies. (*Say.*)

Melampus obliquus, SAY, Journal Acad. Nat. Sc. Phila. II, 377 (Dec. 1822); BINN. ed. 27.—W. G. BINNEY, T. M. IV, 167.—PFEIFFER, Mon. Auric. Viv. 30.

Auricula obliqua, DEKAY, N. Y. Moll. 58 (1843).

It is not now known what shell Say had in view when the above description was written. No authentic specimen is preserved, and no author has seen any shell from that locality answering to the characters laid down. DeKay mentions it among the extra-limital species in his report, his words being nearly a repetition of Say's. Pfeiffer repeats Say's words, and suggests the identity of the species with *Melampus coffea*. Say being familiar with that shell (*M. coniformis, vide* ed. Binn. p. 85), it seems hardly probable he would have described a variety of it.

The question must remain undecided until we are better acquainted with the species of the South Carolina coast.

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Fossil Species.

Melampus priscus, Meek, Phila. Acad. Nat. Sc. Proc. 1860, 315.
Melampus (Ensiphorus) longidens, Conrad, Pr. A. N. Sc. Phila. 1862, 584.

TRALIA, Gray.

Fig. 16.

Animal of *Tralia*,[1] enlarged.

Foot posteriorly acute, entire.

Shell ovate, smooth; spire elevated; aperture narrow, linear, dilated anteriorly; inner lip usually with three oblique plaits; outer lip acute, sinuated posteriorly, internally with one or more transverse, elevated ridges.

This genus differs from *Melampus* in having the foot entire posteriorly, not bifid. It is not admitted by Pfeiffer.

Tralia floridana, Shuttl.—Shell imperforate, ventricose, fusiform, thin, smooth, grayish, with varying chestnut bands; spire regularly conic, acute; suture linear; whirls ten, flattened, the upper ones radiately striate, the last comprising three-fifths of the length of the shell, obsoletely angulated above, and very much smaller at its base; aperture subvertical, narrow, angular; two parietal plicæ, one strong, one on the columella, obliquely continued towards the base; peristome acute, its right side in adult specimens armed with transverse, white, subequal folds, its columellar portions both short and callous. Length 7½, diameter 4½; aperture in length almost 5, in breadth 1⅛ millimetres.

Fig. 17.

Tralia floridana.

Auricula floridana, Shuttleworth, MSS.
Melampus floridanus (*Tralia*), Adams, Pr. Zool. Soc. II, 1854 (no desc.).—Pfeiffer, Malak. Blatt. (1854); Mon. Auric. Viv. 36; Brit. Mus. Cat. 25.—W. G. Binney, T. M. IV, 165, pl. lxxv, f. 30.

Found at Florida Keys.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8541	2	Florida.	W. G. Binney.	Cabinet series.

[1] I do not know what species this represents. It was drawn from nature by Dr. Stimpson, in Charleston harbor.

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Tralia pusilla, GMEL.—Shell imperforate, lengthened-ovate, solid, shining, smooth, marked with microscopic revolving lines, most easily detected on the spire; reddish-brown, with lighter, hardly perceptible revolving bands; suture moderate, less ragged than in the other species; spire elongate-conic; apex acute, shining, black; whirls six to seven, the upper ones flattened, the body whirl obtusely carinated, regularly decreasing in diameter towards the base, and equalling about $\frac{1}{2}\frac{5}{3}$ the length of the shell; aperture subvertical, narrow, rapidly widening towards its base, and equalling in length about $\frac{1}{2}\frac{5}{3}$ of the entire shell; peristome simple, acute, within thickened by callus, and furnished with a rather blunt, short, transverse, not very prominent lamina; the basal termination of the peristome is appressed to the shell, and imperceptibly terminates in a columellar lamina which ascends and winds into the aperture; the columella and parietal wall are covered with a shining callus; there are two parietal teeth, which are white, and enter into the aperture of the shell, the lower one being much the smaller. Internal septæ absorbed. Greatest diameter 5, length 11 millimetres.

Fig. 18.

Tralia pusilla.

Auricula midæ parva fusca unicolor, MARTINI & CHEMNITZ, II, 119, t. xliii, f. 446.—FAVANNE, t. lxv, f. H, 4 (teste PFR.).

Voluta, n. 108, SCHRÖTER, Einl. I, 273.

Voluta pusilla, GMELIN, Syst. 3436 (teste PFR.).—DILLWYN, Cat. I, 507.—WOOD, Ind. pl. xix, f. 20.

Voluta triplicata, DONOVAN, Brit. Shells, V, pl. cxxxviii (1808).—MONTAGU, Test. Brit. Suppl. 99.—DILLWYN, Cat. 507.—WOOD, Ind. pl. xix, f. 19.

Bulimus ovulus, BRUGUIERE, Encycl. Méth. I, 339.

Melampa ovulum, SCHWEIGGER, Handb. 739 (teste PFR.).

Auricula ovula (*Conovula*), FERUSSAC, Tabl. Syst. 108 (absq. desc.).

Auricula nitens, LAMARCK, An. s. Vert. VI, 2, p. 141.—DESHAYES in Lam. VIII, 332; ed. 3, III, 387.—CHEMNITZ, ed. 2, Auric. 18. pl. ii, f. 11–13.

Auricula pusilla, DESHAYES in Lam. VIII, 332.

Conovulus nitens, VOIGHT in Cuv. Thierr. III, 112 (teste PFR.).

Conovulus pusillus, ANTON, Verz. 48.

Melampus pusillus, PFEIFFER, Monog. Auric. Viv. 48; Brit. Mus. Auric. 34.—W. G. BINNEY, T. M. 168, pl. lxxv, f. 29.

Tralia pusilla, H. et A. ADAMS, Gen. Rec. Moll. II (Sept. 1855), 244, pl. lxxxii, f. 8.

The only American specimens I have seen are in my collection. I detected them among marine shells and sand, collected in Florida by Mr. Bartlett.

This species is well known in cabinets by specimens from the

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West Indian Islands, in several of which it exists. Pfeiffer also refers it to the Sandwich Islands.

It is readily distinguished by its shining, mahogany-colored shell. It varies less than most of the *Melampi*.

Tralia cingulata, PFR.—Shell imperforate, fusiform, heavy and thick, shining, polished, with numerous microscopic revolving lines, most prominent on the last whirl; brownish, with numerous irregularly wide, white revolving bands; spire convex-conic, terminating in an acute transparent point; suture simple; whirls ten, the upper ones flattened and narrow, the last one tapering towards the base, and equalling about two-thirds the length of the shell; aperture hardly oblique, very narrow, divided at its base by a stout, sharp columellar fold, which ascends and winds obliquely into the aperture; peristome simple, acute, armed within with from six to eight elongated laminæ, not quite reaching the edge of the lip, the lower one being most fully developed. Length of the specimen before me 11, breadth 5; length of aperture 6 millimetres.

Fig. 19.

Tralia cingulata, 2½ natural size.

Auricula cingulata, PFEIFFER in Wiegm. Arch. f. Nat. 1840, I, 251.—CHEMNITZ, ed. 2, Auric. 40, t. xl, f. 4–6.

Auricula oliva, ORBIGNY, Moll. Cub. I, 189, t. xii, f. 8–10.

Auricula stenostoma, KÜSTER, olim, in Inc.ds2aIfeP)E.F. Ft tes RE fy

Melampus cingulatus, PFEIFFER, Mon. Auric. Viv. 18; Brit. Mus. Cat.—W. G. BINNEY, T. M. IV, 161, pl. lxxv, f. 12–13.

Tralia, H. & A. AD.

The only American specimens of this species I have seen, were collected in Florida by Mr. Bartlett. The species is also found in Cuba, Jamaica, and Porto Rico.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8803	5	Florida.	W. Stimpson.	Cabinet series.

LEUCONIA, GRAY.

Foot divided inferiorly by a transverse groove.

Shell ovate-oblong, imperforate, smooth; spire conical; aperture elongate, oval; inner lip with two plaits anteriorly; outer lip smooth internally, the margin simple, acute.

Of the six species of this genus described, two are found in

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the West Indies, three in Europe, and one of doubtful identity is referred to the United States.

Leuconia sayii, KÜSTER.—Shell small, conic-ovate, shining, horn-colored, striate; spire acute, broadly conic, whirls five, rather convex; aperture oblong, columella biplicate. Length 2½ lines, diam. 1½.

United States. (*Küster.*)

Fig. 20.

Leuconia sayii.

Auricula sayii, KÜSTER in Chemn. ed. 2, 12, pl. vi, f. 14, 15.
Leuconia sayii, PFEIFFER, Mon. Auric. 157; Brit. Mus. Auric. 170.—W. G. BINNEY, Terr. Moll. IV, 177, pl. lxxv, f. 34.

The above is Küster's description. The figure I give is a fac-simile of one of his. This is the only information I have been able to obtain with regard to the species. It has not been described by any other author but Pfeiffer, who merely quotes the above description, not having ever seen the shell.

Küster's figure represents no known American shell; there exists, however, a strong resemblance between it and his figure of *Alexia myosotis*. His original specimen may have been a variety of that species.

Pfeiffer compares the species with *Melampus infrequens*, Ad.

PEDIPES, ADANSON.

Foot divided inferiorly by a transverse groove.

Shell subglobose, imperforate, transversely striated; spire short, obtuse; aperture narrow; inner lip flattened, excavated, with three plaits, the posterior the largest; outer lip posteriorly sinuated, with two teeth internally; margin acute.

Species of *Pedipes* have been found at Panama, in Africa, the West Indies, Madeira, and Isle of France. They are said to inhabit crevices of rocks, especially those exposed to the full force of the tide. The generic name was suggested by the peculiar mode of progression. When the animal walks, the hind part of the foot is fixed, and the fore part, which is separated from the hind part by an extensible groove, is advanced, and the hind half is then drawn forwards so as to touch the anterior half, and so progression is effected by a series of little steps. This movement

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is executed with such quickness that the *Pedipes* is one of the most agile of mollusks.

Pedipes lirata, W. G. Binney.—Shell imperforate, globose-conic, solid, shining, straw-colored, regularly marked with revolving ridges; spire short, depressed, apex obtuse; whirls three, the upper ones short, the lower one about equalling five-sixths the length of the shell; aperture semicircular, its parietal wall covered with shining callus, and furnished with a thick, elevated, hooked and entering fold; columella furnished with two thick, acute, tooth-like processes, placed side by side; peristome acute, furnished on its interior with a shining callus, which is protracted into a high tubercle at its middle. Greater diameter 2½, length 3⅓; length of the aperture 2½ mill.

Fig. 21.

Pedipes lirata, 4 times nat. size.

Pedipes lirata, W. G. Binney, Phila. Acad. Nat. Sc. Proc. 1860, 154.

Cape San Lucas, Lower California.

The specimen figured is the only one found. It may, perhaps, be somewhat related to *P. angulata,* Adams, of Panama, which I have not seen.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8567	1	Cape St. Lucas.	John Xantus.	Cabinet series. Type.

BLAUNERIA, Shuttl.

Shell imperforate, oblong-turreted, thin; aperture narrow, elongated; inner lip with a single plait, columella subtruncate; outer lip simple, straight.

Foot somewhat truncated in front, pointed behind, long as the shell's aperture; head large, projecting beyond the foot, forming a snout with dilated lips; tentacles short, cylindrical, eyes at their superior base.

But one species of this genus is known, the *B. pellucida.* It is one of those shells whose generic position cannot be ascertained without a knowledge of the characters of the animal. It was placed among the *Helicidæ* as *Achatina* and *Tornatellina,* as a *Glandina* among the *Oleacinidæ,* and among the Pectinibranchiates as *Odostomia,* until it was ascertained by Dr. Gundlach to belong to the *Auriculidæ.*

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Blauneria pellucida, Pfr.—Shell sinistral, ovate-lanceolate, acuminate, pellucid, highly polished and glistening. Whirls seven, very oblique, scarcely convex, the last one somewhat ventricose towards the base, about two-thirds the length of the shell; aperture narrow ovate, acutely prolonged posteriorly; lip simple; turning up the columella it becomes thickened, and winds into the aperture in the form of a tooth-like lamella. Length 5 mill.; breadth 1¾; aperture 2 mill. long.

Fig. 22.

Blauneria pellucida.

Achatina (?) pellucida, Pfeiffer in Wiegm. Archiv. 1840, I, 252.—Gould in Binn. Terr. Moll. II, 294, pl. liii, f. 2.

Tornatellina cubensis, Pfeiffer, Symb. II, 130; Monog. Helic. Viv. II, 391.—Chemnitz, ed. 2, Pupa. 151, pl. xviii, f. 16, 17.

Blauneria pellucida, Pfeiffer, Malak. Bl. 1854; Mon. Auric. Viv. 153; Brit. Mus. Cat. 110.—W. G. Binney, T. M. IV, 175.

Odostomia? cubensis, Poey, Mem. I, 394.

Found in Florida, among small shells drifted in the sand.

It has been detected in Cuba, Jamaica, and Porto Rico, and has been introduced into England.

Binney is the only American author who mentions its existence in this country. He places it under *Achatina.* Gould, in Terr. Moll., leaves it in that genus provisionally, mentioning the doubt existing concerning it.

Spurious Species of Auriculidæ.

Otina zonata, Pfeiffer. *Vide Velutina zonata,* p. 22.

Family OTINIDÆ.

Lingual membrane, as in *Auriculidæ,* broad, teeth in numerous cross series. Head large, broad, obtuse, mouth vertically cloven, furnished with distinct jaws. Tentacles flattened, eyes at the upper part of their base.

Shell ear-shaped, colored; columellar margin simple; outer lip simple and acute.

Animal amphibious, living near the sea.

The species of this small family differ from the *Auriculidæ* in having flattened tentacles, and from the *Limnæidæ* in having the eyes on the upper part of the base of the tentacles, instead of at the inner edge of the base, and in having colored shells.

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SPURIOUS SPECIES OF OTINIDÆ.

Fig. 23.

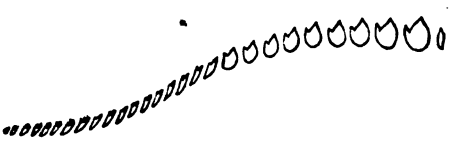
Velutina zonata.

Velutina zonata, GOULD, whose figure I copy (Invert. p. 242), is referred to this family under the name of *Morvillia zonata*, Gray (see Gen Rec. Moll. II, 645). It is a deep-water shell, without doubt belonging to *Velutina*. Pfeiffer describes it also among the *Otinea*, as *Otina zonata* (Mon. Auric. p. 12).

FAMILY LIMNÆIDÆ.

Lingual membrane armed with numerous, quadrate teeth, arranged in transverse rows, the central minute, the laterals

Fig. 24.



Lingual dentition of *Ancylus newberryi*.

uncinated or simply denticulated. Head with a broad, short muzzle, dilated at the end; mouth with one or more jaws; tentacles contractile, flattened or subulate, with the eyes sessile at their inner bases. Mantle margin variously modified; respiratory orifice at the right side. Foot flattened, lanceolate or ovate. Excretory orifices on the left side of the neck. Sexes united; male and female organs with separate orifices, on the right or left side.

Shell of a varied form, thin, horn-colored, usually with an oblique fold on the columella, and with the outer lip simple and acute.

Animal fresh-water, living in the water, usually coming to the surface to respire the free air.

The *Limnæidæ* are found in every quarter of the globe; but in North America most of the genera are represented, excepting *Chilina*, *Camptoceras*, *Amphipeplea*, *Latia*, &c. They are more plenty in species and individuals in the more temperate portions of the continent. Especially among the innumerable lakes of the British possessions do the large species flourish.

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They are strictly aquatic in their habits, abounding in the small quiet streams and stagnant ponds, feeding exclusively on vegetable substances. They usually come to the surface to breathe the free air, but their organs of respiration must be adapted, in some species at least, to breathing through the medium of water, as they are occasionally found in circumstances precluding any possibility of an approach to the surface.

Their eggs are laid in clusters, surrounded by a gelatinous matter.

Many of the species possess the power of gliding along the surface of the water, shell downwards, and letting themselves down by means of a gelatinous thread.

From the fact of my finding young individuals only in the spring, and numerous dead full-grown shells during the late autumn and winter, I presume they arrive at maturity in one season. They are active during the spring, summer, and autumn, but bury themselves in the mud during winter, at least in the Northern States.

The *Limnæidæ* have been grouped by some authors according to the number of their horny jaws, but in the present stage of knowledge of them it seems to me preferable to adopt that division into subfamilies based upon the form of the shell, which is found to be spiral and elongate, spiral and flattened, or non-spiral and simply patelliform.

The shells of some of the various genera present considerable difference in form, but their characters are not as well marked or reliable as in the *Helicidæ*. I have therefore given, under the genus, a description of the typical form, leaving to the subgenera the descriptions of the various diverging forms.

So variable are the species in each of the American genera, and so imperfect is our knowledge of them, I have not attempted a full description of each species at this time. It seems best to me to give all the original descriptions both of true species and synonyms (translated when not in English), and a fac-simile of the original figure of each. My work must therefore be considered rather a report on the present state of our knowledge of the family than an exhaustive monograph. I am in hopes of obtaining material for a more perfect work at some future day.

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Subfamily LIMNÆINÆ.

Shell spiral, more or less elongated, the last whirl large; aperture oblong.

LIMNÆA, Lamarck.

Tentacles flattened and triangular. Mantle with the front edge thickened. Foot short, rounded. Shell dextral, spiral, oblong, translucent, horn-colored; spire acute, more or less produced, last whirl ventricose; aperture large, wide, rounded in front; inner lip with an oblique fold; outer lip simple.

Fig. 25.

Animal of *Limnæa desidiosa.*

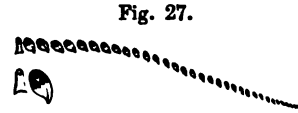
Jaws three, smooth; one upper, large, transversely oblong or ovate; two lateral, rudimentary, narrow, convex.

Lingual membrane (of *L. columella*) broad, teeth crowded, numerous; central narrow, long, apex attenuated, recurved; laterals broad, blunt, apex recurved, denticulated.

Fig. 26.

Jaws of *L. columella.*

Fig. 27.



Lingual membrane of *L. columella.*

This genus is found over almost the whole world, but prefers the more temperate portions of it. In North America, likewise, it is found in greater abundance and perfection in the lake region of the United States, and still more so in the British possessions. In the States bordering on the Gulf, and in Mexico, it is hardly represented.

The geographical distribution of the species is but little known. It seems certain that the boreal regions are inhabited by several species common to similar latitudes in Asia and Europe, such as *L. stagnalis* and *L. palustris.*

The name *Limnæa* is now universally adopted for this genus

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It is useless, therefore, to refer here to the thirty synonyms quoted by Hermannsen.[1]

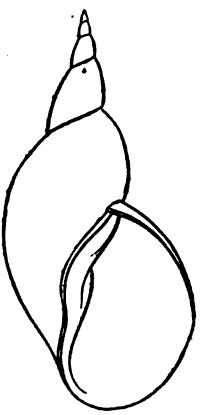
As a subgeneric name for the typical *Limnæa, Lymnus*, Montf. has priority—*Stagnicola*, Leach, being a synonym.

Limnæa stagnalis, Lin.—Shell elongated-ventricose; volutions six; spire regularly attenuated to an acute tip, rather shorter than the aperture; body whirl dilated, proportionally large; aperture ample; columella with the sinus of the fold profound, callus perfectly appressed upon the shell to the base.

Inhabits Lake Superior.

This shell exhibits very much the appearance of *L. stagnalis*, but its body whirl is less proportionally dilated. The callus of the labrum is perfectly appressed to the surface of the whirl even to the base, exactly as in *stagnalis*. I have seen but a single weathered and broken specimen, which was sent me for examination by my friends Messrs. Collins and Barnes, of New York. It was found in Lake Superior, by Mr. Schoolcraft. Since writing the above, Mr. Jessup presented me with several specimens, which he collected in Canandaigua and Cayuga Lakes. (*Say. L. appressa.*)

Fig. 28.



Limnæa appressa, Say.

Limnæa jugularis, Say, Nich. Encycl. 1817, 1818, 1819; ed. Binney, p. 46.—Haldeman, Mon. 16, pl. iv (1841).—DeKay, N. Y. Moll. 74, pl. v, f. 81 (1843).—Küster, Ch. ed. 2, p. 3, pl. i, f. 7.

Limnæa appressa, Say, Journ. Acad. Nat. Sc. II, 168 (1818); Binney's ed. 66.—Haldeman, Mon. 18, pl. v (1842).—Adams, Shells of Vermont, 153 (pamphlet 3), (1842).—DeKay, N. Y. Moll. 74 (1843).—Küster, Ch. ed. 2, 4, pl. i, f. 8–9.

Limnæa stagnalis, Linnæus, &c.—Sheppard (1829), Tr. Lit. Hist. Soc. Quebec, I, 196.—Kirtland, Am. Journ. Sc. [1], XXXI, 35, f. 10; Ohio Report, 200.—Anon. Can. Nat. II, 196, f. 1, 2, 1857.

Limnæa speciosa, Ziegler of Rossmassler, Icon. pt. 2, p. 96; pl. ii, f. 50 (1835).

This species ranges from Vermont, through the northern tier

[1] H. & A. Adams suggest the use of Klein's name *Auricula*, he being the first to notice and describe the genus. I protest against the use of his names in preference to the well-established names of authors who truly understood and followed the Linnæan system of generic nomenclature. (See Sill. Am. Journ. [2], XXXV, 429.)

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of States, to the Pacific Ocean. It is also found in Oregon and southern Utah, though it occurs most plentifully in the lake region of British America. Specimens of it have been collected for the Smithsonian Institution by Mr. Kennicott, at Fort Resolution and Fort Simpson, and at Moose Factory, by Mr. Drexler.

From the means of comparison at my disposal I have no doubt of the identity of the European *Limnæa stagnalis* with this shell. Their proving to be the same will add another to the list of circumpolar species common to the two continents.

Authentic specimens of Mr. Say's *L. appressa* are still preserved in the collection of the Philadelphia Academy. They correspond well, though smaller, with the figure of *appressa* (Fig. 28), which I have copied from Haldeman. I have seen no authentic specimen of Say's *L. jugularis*, but have no doubt of its identity with the shell he afterwards called *appressa*, not only from his comparison of *jugularis* to *stagnalis*, but from the tradition of the earlier collectors, who always have considered them nearly related, if not the same. Mr. Say's description of *jugularis*, in the third edition of Nicholson's Encyclopedia (which is reprinted in my edition of his works), is extremely unsatisfactory, and would hardly be referred to the shell before me, without the words used by him in the first edition. Both are now given.

There is a species of this genus which resembles the *stagnalis* of Europe: we have named it *Limnæa jugularis*. Whirls about six, tapering; mouth within often brownish, lip white, column a little contracted in the middle; we have not a good specimen to describe or figure. (*Say, Nich. Encycl. first ed.*)

There is a species of this genus that we have named *Limnæa jugularis*, and which, in consequence of its having been found but once, must be considered as a doubtful inhabitant of the United States. It may thus be described: Shell tapering; whirls about six; suture not deeply impressed; aperture hardly equal to half the length of the shell, but little dilated; within brownish, particularly on the column, which is contracted in the middle; outer lip white, and almost imperceptibly repand within; umbilicus very distinct. Length one inch. A specimen was also brought from the West Indies, by Mr. L'Herminier, of Charleston. (*Say, 3d ed. Nich. Encycl.*)

Haldeman admits *L. appressa* as a distinct species with doubt, but describes it as more attenuated, lighter in color, and having the spiral striæ better developed than the typical *jugularis*. One of his figures of the latter is copied in my figure (Fig. 29).

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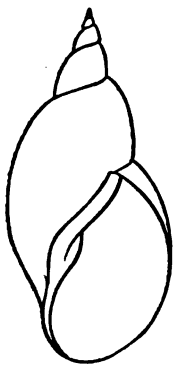
Fig. 29.



Limnæa jugularis.

Adams and DeKay describe *appressa* as a distinct species.

The shell has been figured roughly and described by Dr. Kirtland under the name of *L. stagnalis.* I here give a fac-simile of his figure, and a copy of his remarks, omitting Dillwyn's words.

Fig. 30.

Limnæa stagnalis.

After leaving Trumbull, we enter Portage County (Ohio). In this county we found a number of beautiful ponds, from each one of which flows a perennial stream. One which lies a few miles south of our ronte, in Stark County, called Congress Lake, was, until recently, the only known locality of the fine univalve shell, *Limnæa stagnalis.* It was discovered by Dr. K. in the course of the last season. I have one in my possession which is two inches in length, with the body whirl three-fourths of an inch in diameter. As this rare and elegant shell has not been figured or described by any American Conchologist, a drawing is given at figure 10. The description is copied from Dillwyn, and appears to be so similar to that of our own shell, that there can be no doubt of its identity with the European species, although it is a rare fact, and which scarcely again occurs in all our long list of land and freshwater shells. Geoffroy calls it "Le Grand Buccin." (*Kirtland.*)

An anonymous writer in the Canadian Naturalist also refers the shell to *stagnalis,* giving a copy of a figure of that species in a foreign journal.

The species has also been described and figured, as the following copies show, by Rossmassler, under the name of *Limnæus speciosus,* Ziegl. Haldeman quotes this description in the synonymy of *jugularis,* but afterwards refers it to *L. appressa.*

Shell imperforate, ovate-conical, with a long turreted acutely terminating spire, yellowish-brown, deeply striated, with very delicate striæ under the lens on the whole upper surface; seven whirls, the last not very ventricose, but only slightly arched; no trace of a margin above; the upper whirls form a very long and slenderly drawn-out spire; aperture ovate, acute above, on the left side cut out in a shallow heart shape; outer lip but slightly prominent, and very delicately imbricated; the columellar callus is quite thin and adheres so closely as to be distinguished almost

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Fig. 31.

Limnæus speciosus.

wholly by its white color, and hardly by a perceptible elevation, leaving scarcely any trace of an umbilicus.

Animal ——?

Habitat.—In the fresh-water lakes of North America.

I compared twenty specimens from Lake Erie which appeared perfectly adult and whose characters were constant. This species certainly much resembles *L. stagnalis;* but the invariable tawny color, the decided almost regular striation, the narrower aperture, the outer lip less curved and not prominent, and, finally, the delicate, closely adherent, white columellar callus sufficiently distinguish it. (*Rossmassler.*)

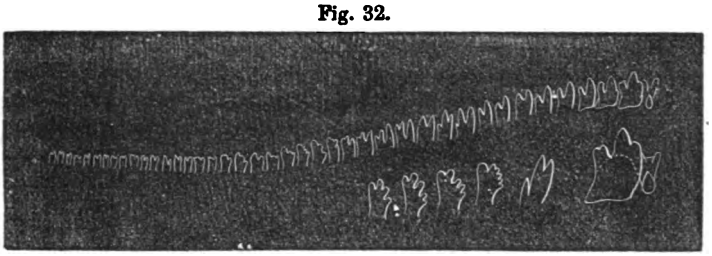
Moquin-Tandon (Moll. Fr. II, 471) places *L. appressa*, Say, in the synonymy of *L. stagnalis*, var. *ζ*, *roseolabiata* (*L. bicolor*, Mke, *L. stagnalis*, var. *obscurus*, Mke.).

Reeve (Brit. L. and Fr. W. Sh.) does not quote Say's species in the synonymy of *L. stagnalis*, but on p. 155 notices the marked degree of parallelism between, if not identity of, *L. limosa* and *L. catascopium*, *L. auricularia* and *L. macrostoma*,[1] *L. stagnalis* and *L. jugularis*, *L. palustris* and *L. elodes*, and *L. truncatula* and *L. desidiosa*.

Limnæa stagnalis is catalogued by Middendorf among the circumpolar species of Asia. It is found in Europe, Siberia, and Cashmere. Like many of our extreme northern species, it appears common to the three continents.

Fig. 32 represents the lingual dentition of an American speci-

Fig. 32.



Lingual dentition of *Limnæa jugularis*.

men of *Limnæa jugularis*. The central tooth is small, narrow, conical. There are 40·1·40 teeth, arranged in a transverse, curving row, of variable form. There are 103 rows in all.

[1] Rather *L. ampla*.

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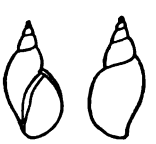
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8301	5	Michigan.	.....	.....
8306	5	Ruby Valley.	Capt. J. H. Simpson.	.....
8307	4	.....	W. Stimpson.	.....
8479	3	Lake Champlain.	W. G. Binney.	Cabinet series.
8954	3	Ft. Simpson, Br. Am.	R. Kennicott.	.....
9063	30+	Hudson's Bay.	Drexler.	.....
9067	50+	Grand Rapids, Mich.	Dr. J. Lewis.	.....
8959	..	Ft. Resolution.	R. Kennicott.	.....
9135	5	Ft. Simpson.	"	.....
9140	5	Moose Factory.	Drexler.	.....
9175	50+	Vermont.	J. E. Chittenden.	.....
9182	2	Black River, N. Y.	Gen. Totten.	.....
9165	4	Milwaukee.	I. A. Lapham.	.....
9154	6	Cayuga Inlet.	Mrs. H. W. Parker	.....
8245	3	Milwaukee, Wis.	I. A. Lapham.	.....
8246	3	Michigan.	.....	.....
8462	3	Southern Utah.	Capt. J. H. Simpson.	In al. with animals.
8473	2	Milwaukee, Wis.	I. A. Lapham.	.....
9285	5	Isle la Crosse.	R. Kennicott.	.....
9287	1	Otter Tail Creek, Minn.	"	.....
9290	20+	Great Slave Lake.	"	.....
9248	3	Lake Superior.	Dr. J. S. Newberry.	.....
9250	2	"	"	.....
9252	5	Rhett L., Cal.	"	.....
9244	5	.....	.....	.....
9322	4	E. of Ft. Colville, W. T.	N. W. Bound. Surv.	.....
9325	12	Near Ft. Anderson, lat. 68°	R. R. McFarland.	.....

Limnæa lepida, GOULD. — Shell very fragile, elongated, very acutely conical, subumbilicate, pale horn-color; whirls five, oblique, moderately convex, forming an acuminated spire; suture moderately impressed; surface smooth and shining, lines of growth faint, and when examined by a magnifier they are found to be rendered somewhat zigzag by distant, revolving furrows, which cross them. Aperture large and expanded, nearly semicircular, half the length of the shell; outer lip expanded; columella having a very strongly marked sharp fold, and broadly covered with a thin callus, which not being closely appressed at the umbilical region, leaves a small chink. Length $\frac{3}{5}$, breadth $\frac{1}{4}$ inch.

Fig. 33.



Limnæa lepida.

Lake Vancouver, Oregon.

Most closely allied to *L. pallida*, Adams, but is much more delicate, the spire more acuminate, the aperture larger and expanded, the fold of the pillar more developed, and the surface well characterized, when closely examined, by the flexuose lines. The whirls are much more oblique and less convex than in *L. desidiosa*. (*Gould.*)

Limnæa lepida, GOULD, Proc. Boston S. N. H. II, 211 (1847); U. S. Ex. Ex. Moll. 121, f. 141, 141*a* (1852); Otia, 41.

The description and figure given above are both copied from Dr. Gould. The original specimens are preserved in the Smithsonian collection.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8571	.. ..	Lake Vancouver, Or.	Com. Wilkes.	Cabinet series.

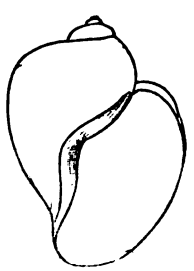
SUBGENUS **RADIX**, MONTF.

Shell subovate, last whirl ventricose; aperture more than half the length of the shell, greatly expanded.

Gulnaria of Leach corresponds to this subgenus, but does not have priority. Klein describes a "Radix Bryoniæ" as a genus (?) at an earlier date than Montfort published, but I do not acknowledge him as authority. He did not use the Linnæan system of nomenclature. H. & A. Adams use Klein's name *Neritostoma*, but his description and figure refer rather to *Succinea*, which would prevent the use of the name, even if Klein were authority.

Limnæa ampla, MIGHELS.—Shell large, much inflated, suboval, rather thin, composed of five convex whirls, prominently shouldered at the upper part; epidermis of an obscure olivaceous green color; lines of accretion very fine and compact; transverse lines obscure, appearing serriform under a magnifier, giving the surface the appearance of very delicate lace work; suture deep, and in one specimen subcanaliculate; spire short and pointed when present; aperture oblong, very wide at the posterior part, but narrowing rapidly anteriorly and occupying rather more than two-thirds the length of the shell; labrum thin and somewhat reflected; labium broadly reflected, forming and partially covering an open and very deep umbilicus; columella fold very prominent; within it is of a light yellowish fawn color, with an obscure purplish zone, one line in breadth, and about two lines within the aperture. Length 1.3, breadth 1, height .8 inches. Divergence of the spire very variable.

Fig. 34.



Limnæa ampla.

Second Eagle Lake, Maine, N. lat. 47°.

This extraordinary and beautiful species was discovered by Mr. Alexander W. Longfellow, civil engineer, while engaged with other gentlemen of the scientific corps in the exploration and survey of the northeastern boundary, in the summer of 1842. He informs me they were very abundant on the shore of the lake, but he had no means of preserving any more than four specimens, all of which are in my collection. No two of

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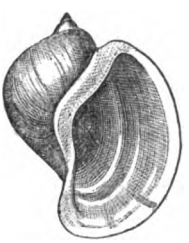
the specimens are exactly alike; but notwithstanding this and the remarkable difference between those represented in the plate, I doubt not they are specifically the same. It is allied to *L. decollata*, Nobis, but it is readily distinguished from that shell by its amplitude, by a proportionately larger penultimate whirl, by the reflected labrum, by a much broader labium, and by an open umbilicus, which is always entirely closed in *L. decollata*. I regard that represented by fig. *a* as the prevailing type of the species. Fig. *b* is a little shorter, and rather more tumid; fig. *c* represents a distorted specimen. (*Mighels.*)

Limnæa ampla, MIGHELS, Bost. Journ. N. H. IV, 347, pl. xvi, f. 1, *a*, *b*, *c* (Apr. 1843); Proc. I, 129 (Oct. 1843), not of HARTMANN.[1]—WHITEAVES, Can. Nat. (Apr. 1863), VIII, 112, f. 11.

This is a well-marked species, not easily confounded with any other. The description and Fig. 34 are copied from Mighels. Since their publication, the species seems to have been entirely unnoticed till Mr. Kennicott found it at Fort Simpson.

The European species most nearly related to *L. ampla* is *L. auricularia*. So strong is the resemblance between some forms of the two that their identity is almost suggested. I have, therefore, copied Moquin-Tandon's figure of *L. auricularia*.

Fig. 35.



Limnæa auricularia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
..	..	British America.	Kennicott.	.....
9283	50+	Isle La Crosse.	"	.....

Limnæa decollata, MIGHELS.—Shell very ventricose, rather thick, subovate or subrotund, in outline an irregular rhomboid; epidermis of an olivaceous green color, rather thin, deciduous; whirls two to three; spire very short, generally decollated; whole surface generally rather rough; striæ of growth coarse and fine alternately; transverse striæ on the body whirl sparse, interrupted, sometimes obsolete; body whirl composes almost the whole shell; aperture very large, subcampanulate; its length is very little greater than the breadth, and occupies more than two-thirds the length of the shell; labrum rather thin, simple; fold of the columella very prominent. Length .6, breadth .5, height .4 inch.

Fig. 36.

Limnæa decollata.

[1] *Gulnaria ampla*, Hartmann, 1842, is referred by Reeve to *L. auricularia*. Should it prove a distinct species, our shell might be called *L. mighelsi*.

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Animal dingy mouse-color, with a slight tinge of purple, covered with numerous microscopic, elongated white spots on every visible part of the surface, including the mouth and tentacula; foot of a chocolate color, rather broad, length rather greater than the aperture; habits sluggish. Cabinets of the Bost. Soc. N. H., Dr. Gould, S. S. Haldeman, J. G. Anthony, J. W. Mighels, and C. B. Adams.

Unity, Maine, discovered by Dr. Milliken of that town, to whom we are indebted for specimens.

This odd but interesting shell is readily recognised by its rhomboidal aspect, wide aperture, and rather rough and distorted appearance. It is allied to *L. catascopium*, Say, but is distinct from that shell by having less whirls by two, and a much shorter spire; by being wider, and its divergence greater by more than thirty degrees. By some it has been supposed to be identical with *L. emarginata*, Say. This is impossible. *L. emarginata* is much more cylindrical, the divergence of its spire is scarcely half as great as that of our shell; it is much thinner, and has at least two more volutions. Our shell is also destitute of the "deep emargination" which distinguishes *L. emarginata*. (*Mighels & Adams.*)

Limnæa decollata, MIGHELS, Proc. Bost. Soc. I, 49 (1841); Bost. Journ. IV, 4–5, 336, pl. iv, f. 13 (and ADAMS) (1842).

Limnæa catascopium, HALDEMAN, part, Mon. 52, pl. xiv, f. 1–3 (1842).

Limnæus decollatus, KÜSTER in Ch. ed. 2, 45, pl. viii, f. 11–14.

Fig. 37.

Limnæa decollata.

Found around Lake of the Woods, in Maine and Connecticut.

Haldeman and DeKay refer this species to *L. catascopium*. I have given the original description and figure above. No. 9132, presented by Prof. Haldeman, were by him received directly from Mighels. One is figured in Fig. 37.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8300	9	Lake of the Woods.	R. Kennicott.	.....
8481	1	Maine.	W. G. Binney.	Cabinet series.
9132	6	"	Haldeman.	From Mighels.

Limnæa columella, SAY.—Shell thin, fragile, horn-color; whirls four, longitudinally wrinkled. Spire prominent, acute. Suture not much impressed. Aperture dilated, ovate. Columella much narrowed near the base, so that the view may be extended from the base almost to the interior apex of the shell. Length $\frac{7}{10}$ of an inch nearly, of the spire $\frac{4}{5}$ inch.

Inhabits stagnant waters and miry places. Collection of the Academy.

Animal aquatic, base not so long as the aperture; dusky, with small

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whitish spots; tentacula broad, pyramidal, compressed; eyes small, black, placed at the inner base of the tentacula.

This species is allied to *L. catascopium* of the American edition of Nicholson's Encyclopedia, but the revolution of the whirls is more oblique, the shell thinner, the aperture much more dilated, and the columella differently formed. For several specimens of this shell I am indebted to Mr. Titian Peale.

Fig. 38.

Limnæa columella.

Var. *a*. Small, black. From Cold Water Creek of the Missouri. This is most probably a distinct species; we obtained but a single specimen of it. (*Say.*)

Limnæa columella, Say, Journ. Acad. Nat. Sc. Phila. I, 14 (1817); II, 167 (1821).—Nich. Enc. 3d ed. (1819); Binney's ed. 60, 56.—Haldeman, Mon. 38, pl. xii (1842).—Gould, Inv. of Mass. 215, f. 144, 216, f. 145 (1841).—DeKay, N. Y. Moll. 72, pl. iv, f. 75 (1843).—Potiez et Michaud, Gal. I, 216, pl. xxii, f. 5, 6.—Anon. Can. Natural. II, 197, fig. (1857).

Limneus columella, Küster in Ch. ed. 2, 44, pl. viii, f. 3–5.

Limnæa chalybea, Gould, Am. Journ. Sc. [1], XXXVIII, 196 (1840); Otia, 180.

Limnæa macrostoma, Say, Journ. Acad. Nat. Sc. II, 170 (1821); Binney's ed. 67.—Gould, Inv. 217, f. 148 (1841).—Anon. Can. Nat. II, 198, fig. (1857).

Limneus macrostomus, Küster in Ch. ed. 2, 43, pl. viii, f. 1, 2.

Limnæa acuminata, Adams, Am. Journ. Sc. [1], XXXIX, 374 (1840).

Limnæa navicula, Valenciennes, Rec. d'Obs. II, 251 (1833).

Limnæa strigosa, Lea, Proc. Am. Phil. Soc. II, 33 (1841); Trans. IX, 12 (1844); Obs. IV, 12.

Limnæa coarctata, Lea, Proc. Am. Phil. Soc. II, 33 (1841); Trans. IX, 11 (1844); Obs. IV, 11.

Limnæa casta, Lea, Proc. Am. Phil. Soc. II, 33 (1841); Trans. IX, 11 (1844); Obs. IV, 11.

Limnæa columellaris, Adams, Sill. Journ. [1], XXXVI, 392, absq. descr.

Limnæa succiniformis, Adams MS. teste Haldeman.

This species has been found from New England and Lake Superior to Georgia. Its wide range and variable form has caused its being described under several names, which are mentioned in the synonymy and treated at length below. Mr. Say's specimens of *L. columella* are still preserved in the Philadelphia Academy. One is drawn in my figure (Fig. 38). Specimens of his *L. macrostoma* also are there preserved, one being drawn in my figure (Fig. 39). From an examination of it and of the following description, I am led to coincide with Haldeman and DeKay's opinion of its identity with *L. columella*.

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Limnæa macrostoma, Say.—Shell suboval; whirls five, body whirl somewhat reticulated; suture not profoundly indented; spire about two-thirds the length of the aperture, acute; aperture much dilated; labrum not thickened on the inner submargin.

Fig. 39.

Limnæa macrostoma.

Inhabits Cayuga Lake. Length ½ inch, and upwards.

Imperfect specimens of this shell were found on the shore of Cayuga Lake, by Mr. A. Jessup, but they are sufficiently entire to exhibit considerable similarity to some varieties of *L. auricularius*, of Europe. It may readily be distinguished from *L. catascopium* by its much more dilated aperture. (*Say.*)

Limnæa acuminata, Adams, seems a synonym of *L. columella*. Haldeman and DeKay so consider it, and Gould refers it to *L. macrostoma*. I have seen no authentic specimen, but give the original description below. It must not be confounded with Brongniart's species of the same name.

Limnæa acuminata, Adams.—Shell fragile, semi-transparent, ovate, with very numerous, revolving, irregular, transverse, parallel striæ; whirls four; spire very short, subacute; last whirl very large; aperture very large, exhibiting the interior of the spire; columella thin, sub-reflected; labium not appressed.

New Bedford.

This differs from *L. columella*, Say, in the much greater proportional size of the last whirl, the breadth of the shell, and the presence of very distinct revolving lines. It resembles *Succinea obliqua*, Say, but the spire is rather less, and no revolving lines are mentioned in the description of that species. The *L. acuminata* has also been found at Horn Pond, in Woburn, Mass., by T. J. Whittemore, Esq. (*Adams.*)

Limnæa chalybea, of Gould, whose description and figure are here copied, is no doubt a form of *L. columella*. It is so stated by him recently (Otia, p. 180), as well as by Haldeman in his Monograph.

Limnæa columella, var. *chalybea*, Gould.—The spire is more pointed, its divergence only about 50°; the aperture is more expanded, and the fold on the inner lip more obvious. It is thin, but not very brittle, ringing like hard-burnt brockery. The last whirl is partially detached from the preceding one, so as to form a thread-like channel at the suture. The enamel rests loosely against the shell, and is wrinkled. The exterior is covered by a bluish-black pigment, not easily removed, and the interior has a steel-blue or black lead color.

Fig. 40.

Limnæa columella, var. *chalybea.*

This shell, which I found two years in succession in a muddy pool in Cambridge, I thought was sufficiently distinct to be regarded as a new species; and I accordingly gave its

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characters under the name of *Limnæa chalybea*, in Silliman's Journal, XXXIII, 196. But as it has not been found in any other place, I am now disposed to regard it as a strongly marked local variety of *L. columella*. It is very possibly such a shell to which Mr. Say alludes in the Journ. Ac. Nat. Sc. II, 167, as *L. columella*, var. *a.*, small, black, from Cold Water Creek, Missouri. (*Gould.*)

Limnæa navicula, of Valenciennes, whose description follows, is said to be a form of *L. columella*, by Haldeman and Gould, and also by Ferussac (Bull. Zool. p. 35, 1835) and Küster. I have seen no specimen or figure of it.

Limnæa navicula, VALENCIENNES.—Shell oval, pointed, subdiaphanous, whirls four, substriate. The last whirl is four times as long as the three others. The aperture is large and gaping, its length equalling two-thirds the shell's length. Shell very thin, slightly transparent. Color grayish-yellow. Length 10 lines.

Hab. Environs of Philadelphia. (*Valenciennes.*)

Finally, an examination of the specimens from which Mr. Lea drew his descriptions of *Limnæa strigosa, coarctata*, and *casta*, have convinced me of their identity with *L. columella*. In the case of the second species Haldeman agrees with me, he makes no mention of the others. Mr. Lea's descriptions are copied below, and a figure given of each of the three forms, drawn from his types.

Limnæa strigosa, LEA.—Shell long-oval, somewhat oblique, diaphanous, striate, horn-colored, thin, imperforate; spire short; sutures impressed; whirls five, somewhat convex; aperture ovate.

Fig. 41.

Limnæa strigosa.

Hab. Near Cincinnati, Ohio. T. G. Lea. My cabinet and cabinet of T. G. Lea. Diam. .38, length .75 of an inch.

This is a very thin fragile species, somewhat resembling *L. columella*, Say, but may at once be distinguished from that species by its longer spire and less inflated body whirl. It is allied to *L. coarctata*, herein described; differing, however, in being more oblique, and in having the whirls more inflated. The aperture is about three-fourths the length of the shell, and acutely angular above. (*Lea.*)

Limnæa coarctata, Lea, is also referred to *L. macrostoma*, by Küster, *l. c.* Mr. Lea's description here follows, with a drawing of his original specimen.

Limnæa coarctata, LEA.—Shell fusiform, very thin, obsoletely striate, diaphanous, horn-color, imperforate; spire short, pointed; sutures slightly impressed; whirls four, rather flattened; aperture large, ovate.

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Hab. Newport, Rhode Island: Col. Totten, United States Army. My cabinet and cabinet of Col. Totten. Diam. .30, length .55 of an inch.

Fig. 42.

Limnæa coarctata.

This is one of the most delicate and fragile of the genus *Limnæa* which I have seen. It is allied to Mr. Say's *L. columella;* but may at once be distinguished by the compression of the superior part of the body whirl, which causes an acute angle in the superior part of the aperture. Under a rather powerful lens, some of the specimens may be perceived to have very minute revolving striæ. The aperture is two-thirds the length of the shell, and is inflated at the inferior part. The fold of the columella is delicate and incurved. (*Lea.*)

Limnæa casta, Lea.—Shell subfusiform, rather thick, closely striate, yellow, perforate; spire rather elevated, acuminate; sutures impressed; whirls six, convex; aperture large, ovate.

Fig. 43.

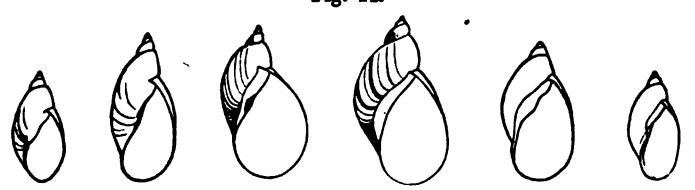
Limnæa casta.

Hab. Poland, Ohio: Dr. Kirtland. My cabinet and cabinets of Dr. Kirtland, and T. G. Lea. Diam. .30, length .58 of an inch.

The columella of this species is remarkably straight, and being reflected, causes the lower part of the aperture to be slightly effuse. The last whirl is wrinkled. The aperture is more than half the length of the shell. It is allied to *L. desidiosa*, Say, but is a smaller species, has the spire more exserted, and a less curved fold. The perforation is very small. Dr. Kirtland kindly sent me many specimens several years since. (*Lea.*)

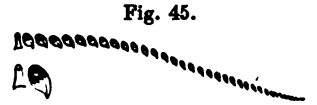
Fig. 44 represents, at one view, the various forms which have been described as distinct species.

Fig. 44.



L. coarctata. *L. casta.* *L. macrostoma.* *L. columella.* *L. chalybea.* *L. strigosa.*

Fig. 45.



Lingual dentition of *L. columella.*

Fig. 45 represents the lingual dentition of the species. There are eighty rows of about seventy teeth each.

Dr. T. R. Ingalls, of Greenwich, N. Y., to whom I am indebted for many specimens of shells and much valuable information, wrote me in 1860 the following curious note regarding *L. columella.* His words are—

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"The *L. macrostoma* which I send you requires a note. It comes as near a case of spontaneous generation as anything within my observation. It was found in a little pool about twenty feet in diameter, entirely cut off from streams and fed by a spring. I had for years frequented it for Desmidia, &c., in which it was very rich. One season, and one only, appeared these *Limnææ*, which do not occur elsewhere, as far as I now know, within twenty miles. The pond dried up that season and destroyed the locality."

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8295	3	Ohio.	.....	.....
8296	7	St. Simon's Island, Ga.	.....	.....
8297	1	Marietta, O.	W. Holden.	.....
8298	9	South Carolina.	W. Stimpson.	.....
8299	5	.....	W. G. Binney.	Var. *chalybea*, Gld.
8482	2	.....	"	Cabinet series.
9139	12	St. Simon's, Ga.	Postell.	.....
8979		San Felipe Spr.	Capt. Beale.	.....[by Say.
8522	1	.....	Ac. N. Sc. Phila.	Marked *L. macrostoma strigosa*, teste Lea.
9251	9	Massachusetts.	.....	

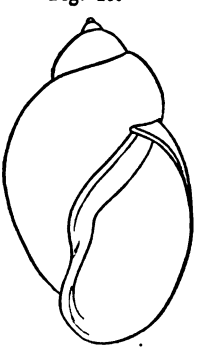
SUBGENUS **BULIMNEA**, HALD.

Shell thick in texture, ovate, inflated; spire short, outer lip not expanded.

Limnæa megasoma, SAY.—Large, dilated suboval; spire short, rapidly diminishing, acute; whirls about five, rounded, obtusely wrinkled across; body whirl large, the wrinkles very obvious, suture deeply impressed; aperture subovate, much longer than the spire, within chestnut-brown; columella white. Length more than one and six-tenths of an inch; greatest diameter one inch.

This remarkably large and fine species was found in Bois Blanc Lake, Northwest Territory, by Dr. Bigsby, to whom I am indebted for specimens. The color is brownish, sometimes lineated across the body whirl with dull greenish and pale ochraceous; and the chestnut-brown color of the interior of the shell, combined with its large dimensions, distinguish this species from all others yet discovered in this country. (*Say.*)

Fig. 46.



Limnæa megasoma.

Limnæus megasomus, SAY, Long's Exp. II, 263, pl. xv, f. 10 (1824); BINNEY's ed. 129, pl. lxxiv, f. 10.—KÜSTER in Ch. ed. 2, 36, pl. vi, f. 20, 21.

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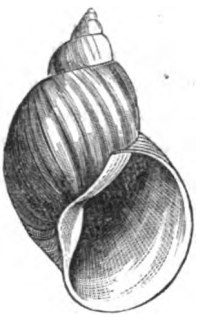
Limnæa megasoma, HALDEMAN, Mon. 13, pl. iii, f. 1–3 (1841).—ADAMS, Shells of Vermont; Thoms. Vt. 153, excl. fig., pamphlet, p. 3 (1842).—DEKAY, N. Y. Moll. 70, pl. iv, f. 70 (1843).

Bulimnea megasoma, CHENU, Man. de Conch. II, 480, f. 3543.

Fig. 47.



Limnæa megasoma.

This is a northern species, ranging from Lake Champlain to Michigan. The shell, by which it is commonly represented in collections, corresponds perfectly with Mr. Say's types in the Philadelphia Academy. His description and figure are copied above (Fig. 46).

Prof. Adams' figure does not represent this species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8253	1	Burlington, Vt.	.....	.....
8254	6	Lake Champlain.	W. Stimpson.	.....
8487	2	"	"	Cabinet series.
9249	4	Lake Superior.	Dr. J. S. Newberry.	.....

SUBGENUS **LIMNOPHYSA**, FITZ.

Shell ovate-oblong; spire conic, about as long as the aperture, whirls rounded; outer lip not spreading.

The date of publication of *Limnophysa* is 1833—*Limnæa palustris* being the type. I find this prior to all other names for the section. *Stagnicola*, Leach, was first described in 1840, in Gray's edition of Turton, Leach's work was not then printed, and the edition of Turton bearing date 1831 gives no description, merely referring in the synonymy of several species to Leach's manuscript. *Galba*, Schrank, antedates *Limnophysa*, but is placed in the synonymy by Herrmannsen, no doubt for valid reasons.

Limnæa reflexa, SAY.—Shell fragile, very much elongated, narrow, honey-yellow, tinctured with brownish, translucent, slightly reflected from the middle; volutions six, oblique, wrinkled transversely; spire more than one and a half times the length of the aperture, acute, two or three terminal whirls vitreous, body whirl very much dilated; aperture rather narrow; labrum with a pale margin, and dusky red or blackish sub-margin.

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Inhabits Lakes Erie and Superior. Total length $\frac{1}{1}\frac{3}{0}$,[1] of the aperture $\frac{1}{2}\frac{1}{0}$ of an inch.

This shell is remarkable for its narrow and elongated form, and for the consequent very oblique revolution of the whirls. When viewed in profile it has a slightly reflected appearance. It was kindly sent to me for examination by my friends Messrs. S. B. Collins and D. H. Barnes, of New York, and was found in Lake Superior by Mr. Schoolcraft. I recollect to have seen a specimen two or three years since brought from Lake Erie by James Griffiths. It is proportionally longer than *elongatus*. (*Say.*)

Fig. 48.

Limnæa reflexa.

Limneus reflexus, Say, Journ. Acad. Nat. Sc. Phil. II, 167 (1821); Am. Conch. IV, pl. xxxi, f. 2 (1832); Binney's ed. 65, 188, pl. xxxi, f. 2; ed. Chenu, 44, pl. vii, f. 4. —Küster in Ch. ed. 2, 41, pl. vii, f. 11, 12.

Limnæa reflexa, Haldeman, Mon. 26, pl. viii (1842). — DeKay, N. Y. Moll. 71, pl. iv, f. 65, 72 (1843).

Limneus elongatus, Say, Journ. Ac. Nat. Sc. Phil. II, 167 (1821); Long's Exp. II, 263; Binney's ed. 65, 130; ed. Chenu, 43, pl. vii, f. 5.

Limneus umbrosus, Say, Am. Conch. IV, pl. xxxi, f. 2 (1832); Binney's ed. 187, pl. xxxi, f. 2.—Haldeman, Mon. 24, pl. vii (1842).—DeKay, N. Y. Moll. 68, pl. iv, f. 76 (1843).—Küster in Ch. ed. 2, 41, pl. vii, f. 13–16.

Limnæa exilis, Lea, Tr. Am. Phil. Soc. V, 114, pl. xix, f. 82 (1837); Obs. I, 226.—Küster (*Limnæus*) in Ch. ed. 2, 40, pl. vii, f. 9.

Limnæus palustris, var. *distortus*, Rossmassler (1835), Icon. I, 97, pl. ii, f. 52.

Limnophysa reflexa, Chenu, Man. de Conch. II, 480, f. 3544.

This species has been observed through the northern tier of States, from New York to the Pacific, and in Canada. It extends more to the southward in the western portions of its area, having been found in Kansas and Utah, and in the Columbia and Sacramento Rivers.

I have given above a copy of Mr. Say's description of this species, and a fac-simile (Fig. 48) of the outline of one of his figures. It is a well-known shell, found in great numbers, and common in collections. It is subject to much variation, as shown by the large suite in the collection. Three forms have been described as distinct species, and are treated at length below. It is also readily confounded with *Limnæa fragilis*, so as indeed almost to warrant the conclusion of Forbes & Hanley that "the

[1] Probably $1\frac{3}{10}$ inch.

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reflexa, *umbrosa*, and *elodes* of Say, which form apparently but one species, are scarcely distinguishable from this variable shell (*palustris*)."

Mr. Say's type of *Limnæa umbrosa* is still preserved in the Philadelphia Academy. My Figure 49 is a fac-simile of the outline of one of his, and a copy of his description here follows. The name *umbrosa* was substituted by Mr. Say for the pre-occupied *elongatus*. The shell is considered distinct by Haldeman and DeKay, doubtfully so in Adams' Shells of Vermont.

Limneus elongatus.—Shell horn-color, tinged with reddish-brown; spire elongated, tapering, acute; whirls six or seven, slightly convex, wrinkled across; body whirl, measured at the back, more than half the total length; suture moderately indented; aperture less than half the length of the shell; labium with calcareous deposit. Length one and three-tenths inch.

Fig. 49.

Limnæa umbrosa.

Inhabits, in considerable numbers, the ponds and tranquil waters of the upper Missouri. It is very distinct from *L. catascopium*, by the much greater proportional length of the spire. (*Say* in J. A. N. S.). Rainy Lake and Seine River f Upper Canada.

I am under the necessity of changing the name which I first applied to this shell, that of *elongatus* being pre-occupied by Draparnaud for a very different species. The fold of the columella is much less profound than that of *L. palustris*, Lin., which it much resembles. (*Say* in Am. Conch.)

Limnæa plebeia, Gould, is quoted doubtfully as a synonym of *L. umbrosus*, by Adams (Middlebury Shells, and Sill. Journ. [1], XL, 268). I refer it, however, to *L. palustris*, as that species is found in Massachusetts, while *umbrosa* is not. Gould mentions *plebeia* by name only in the Catalogue of Massachusetts Shells.

My opinion of the identity of *Limnæa exilis* with *L. reflexa* is based upon an examination of Mr. Lea's original specimen. His description and figure here follow. Haldeman and DeKay place *exilis* in the synonymy of *reflexa*.

Limnæa exilis.—Shell attenuated, very thin, longitudinally striate; whirls seven, plano-convex, columella reflected; aperture ovate-oblong.

Ohio. My cabinet. Diam. .4, length 1.5 inch.

This is, perhaps, the most attenuated *Limnæa* yet observed in this country. It approaches most to the *reflexus*, Say, but is more elongate than that species. The most remarkable character of the *exilis* is, per-

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haps, the reflection of its labium, which is not laid on the body of the whirl. Where it joins above with the labrum, the angle is quite acute, and is separated from the body whirl. The specimen figured was not taken alive, and the epidermis being destroyed, the description and representation are partially defective. The aperture is about two-fifths the length of the shell. (*Lea.*)

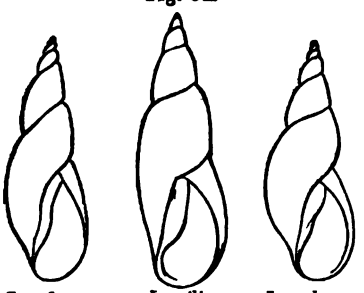
Fig. 50.

Limnæa exilis

I was at first inclined to place *Limnæa haydeni* in the synonymy of this species. It appears to be distinct after more careful study of the specimens in the collection.

Fig. 51 gives, at one view, the various forms which I have considered synonyms of *L. reflexa.*

Fig. 51.



L. reflexa. *L. exilis.* *L. umbrosa.*

Limnæus palustris, var. *distortus*, of Rossmassler, is a form of this species, as shown by his figure, of which a fac-simile is here given (Fig. 52).

Fig. 52.

L. palustris, var. *distortus*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8224	8	Milwaukee, Wis.	I. A. Lapham.	.....
8225	4	Big Sioux.	.....	.....
8226	16	Illinois.	.....	.....
8227	7	.....	.....	.....
8228	8	Goose Island, Mich.	.....	.....
8229	26	Big Sioux.	.....	.....
8230	8	Milwaukee Wis.	I. A. Lapham.	.....
8231	20	.....	.....	.....
8232	1	St. Clair River.	.....	.....
8233	3	.....	.....	.....
8234	7	Farwell's Mills, Madi-	Prof. S. F. Baird.	.....
8235	1	Illinois. [son, Wis.	.....	.....
8236	7	Prairie Lke, n. Red Riv.	R. Kennicott.	.....
8237	2	Toledo, O.	F. A. Bossard.	.....
8238	3	Ohio.	Dr. J. Lewis.	.....
8239	11	Goose Island, Mich.	.....	.....
8240	8	Milwaukee, Wis.	.....	.....
8241	4	Illinois.	Dr. J. Lewis.	.....
8242	13	Grindstone Creek.	.....	.....
8243	15	Ft. Peirce.	.....	.....
8491	1	Aztalan, Wis.	Prof. S. F. Baird.	Cabinet series.
8319	6	.....	.....	.....
8521	5	.....	.....	Cab. series.
3523	3	Pacific Coast.	.....	"
8734	2	San Francisco.	Rowell.	.....
9066	200+	Milwaukee.	Lewis.	.....
9139	20+	.....	"	.....

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Limnæa attenuata, Say.—Shell elongate turreted, somewhat translucent; spire slender, attenuated, acute; whirls six or seven, with but a very slight convexity; wrinkles more distinct towards the aperture; body whirl, measured at the back, obviously less than half the total length. Length one inch.

Fig. 53.

Limnæa attenuata.

Inhabits Mexico.

This species abounds in ditches and ponds in the vicinity of the capital. It is more nearly related to *L. reflexus*, nob., than to any other known species of North America; but it is only necessary to compare the two in order to perceive a wide difference between them. The present is smaller and proportionally more slender, and the spire is more attenuated. (*Say.*)

Limnæa attenuata, Say, New Harm. Diss. II, 244 (1829); Binney's ed. 148; Descr. 23.—DeKay, N. Y. Moll. 75 (1843).—Haldeman, Mon. 28, pl. ix, f. 1–5 (1842).—Küster (*Limnæus*), Chemn. ed. 2, 39, pl. vii, f. 8.

Limnæus subulatus, Dunker in Küster, Ch. ed. 2, 24, pl. iv, f. 24.

Figure 53 is drawn from an authentic specimen of Mr. Say. His description is given above.

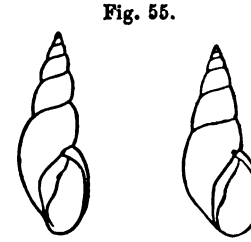
In describing the habitat of *Planorbis tenuis*, in Chemnitz, ed. 2, *Limnæus subulatus* is mentioned as common among graves near Mexico. There is also a *L. subulata*, Kickx, mentioned in Dupuy's Mollusques de la France, p. 463. But the species referred to is, I suppose, the one described in Küster's ed. 2 of Chemnitz, Limnæa, p. 24, pl. iv, f. 24. As the last livraison devoted to Limnæa, which has reached this country, contains only a portion of the description of the species, I cannot say what locality is given by Küster for the shell. The figure corresponds with *Limnæa attenuata*, Say. It is copied in Figure 54. A translation of the description here follows:—

Shell imperforate, subulate-turreted, solid, striated, reddish horn-color; spire elongate, subulate, acuminate; whirls seven, flattened; aperture semioval, yellowish-red, sanguineous at the base; peristome straight, sharp, oblique, with a distinct columellar fold. (*Dunker.*)

Fig. 54.

Limnæa subulata.

Fig. 55.



L. attenuata. *L. subulata.*

Since writing the above the succeeding part of Chemnitz, ed. 2, having arrived, I find the locality to be Mexico, at Zimapan and Lake of Mexico.

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Fig. 55 gives, at one view, the two forms which I have considered synonymous.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8294	7	City of Mexico.	.....	.....
8483	5	"	. ....	Cabinet series.

Limnæa sumassi, BAIRD. — Shell elongate, attenuated, horn-colored, fragile; whirls six, the last twice the size of the remainder; aperture moderate; columella strongly plicate; external surface with microscopic, crowded, very minute decussations. Length of largest 1⅛, breadth ½ inch.

Fig. 56.

Limnæa sumassi.

Hab. Sumass Prairie, Fraser River, British Columbia.

Fig. 57.

Limnæa sumassi.

This species of *Limnæa* approaches *L. elodes*, Say, but is more elongated, more fragile, and has the columella very strongly plicated. The surface of the shell, when seen under a lens of moderate power, is finely decussately striated. It is of a horny color, and is of an elongated shape. (*Baird.*)

Limnæa sumassi, BAIRD, Proc. Zool. Soc. London, 1863, p. 68.

This species was collected by the British Boundary Commission. Members of the American Commission also collected the specimens in the Smithsonian collection, which show the species to be extremely variable. I have copied above the original description and two figures from the advance plates of the British Report, kindly furnished by Mr. Carpenter.

Fig. 58.

Limnæa sumassi?

A curious specimen, from Ft. Colville (Northwest Boundary Survey), is figured in Fig. 58. It may be referable to this species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9320	30	E. of Ft. Colville, W. T.	N. W. Boundary Surv.	.....

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Limnæa haydeni.—Shell ovate conic, smooth, thin, light horn-colored, imperforate; spire rather short; whirls five, convex; sutures deeply impressed; aperture ovate; columella strongly plicate.

Fig. 59.

Limnæa haydeni.

Yellowstone and Big Sioux: Dr. Hayden. (*Lea.*)

Limnæa haydeni, Lea, Proc. Acad. Nat. Sc. Phila. 1858, 166.

I was at first inclined to place this species in the synonymy of *Limnæa reflexa.* Upon more careful examination of the specimens collected by Dr. Hayden (one of which is here figured), I am satisfied of its being distinct. Its rounded whirls and strongly plicate columella are its chief characteristics.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8250	18	Yellowstone River.	.....	Original lot named by
8251	27	Ruby Valley.	Capt. J. H. Simpson, Army of Utah.	[I. Lea.
		[River.		"Swamps."
8252	8	Mo. of the Yellowstone	.....	"In alluvial."
8255	4	Big Sioux.	.....	Named by I. Lea.
8523	9	30 m. w. of Ft. Kearney.	.....	.....
8270	28	Bet. Pike L. & Ft. Union.	Gov. J. J. Stevens.	.....
8485	2	Mo. of Yellowstone.	.....	Cabinet series.

Limnæa palustris, Müll.—Shell oblong conic, gradually acuminated, reticulate with transverse lines and longitudinal wrinkles; whirls rather more than six; spire acutely terminated; suture moderately impressed; aperture shorter than the spire; labrum, inner sub-margin, reddish obscure; labium, calcareous deposit rather copious, not appressed at base, but leaving a linear umbilical aperture; body whirl on the back longer than the spire.

Fig. 60.

Limnæa elodes.

Inhabits Canandaigua Lake.

Var. *a.* Whirls simply wrinkled across, the calcareous deposit at base appressed to the surface of the whirl.

This species was found by Mr. A. Jessup; it bears the most striking resemblance to *L. palustris.* The variety was found by the same enterprising mineralogist at Morristown, New Jersey. I have subsequently received specimens from Mr. S. B. Collins, of New York, who procured them in a marsh near the Saratoga Springs. (*Say*, J. A. N. S.) The fold of the columella is much more profound than that of *umbrosus.* (*Say*, Am. Conch.)

Helix palustris, Müller, &c., Rackett, Tr. Linn. Soc. XIII, 42 (1822).

Limnæus elodes, Say, Journ. Ac. Nat. Sc. Phil. II, 169 (1821); Am. Conch. IV, pl. xxxi, f. 3 (1832); Binney's ed. 66, 188, pl. xxxi, f. 3; ed. Chenu, 44, pl. viii, f. 3.—Küster in Ch. ed. 2, 42, pl. vii, f. 17–21.

Limnæa elodes, Gould, Inv. of Mass. 221, f. 146, 147 (1841).—Adams,

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Shells of Vermont, in Thoms. Hist. 153 (1842).—ANONYMOUS, Can. Nat. II, 199, fig. (1857).

Limnæa fragilis (not of LINNÆUS),[1] HALDEMAN, Mon. 20, pl. vi, xv, f. 1 (1842); 53, pl. xiv, f. 1—DEKAY, N. Y. Moll. 68, pl. iv, f. 68 (1843).

Limnæa palustris, MÜLLER (*Buccinum*), &c.—SHEPPARD (1829), Tr. Lit. Hist. Soc. Quebec, I, 196.

Limnæa nuttalliana, LEA, Pr. A. P. S. II, 33 (1841); Tr. Am. Phil. Soc. IX, 9 (1844) · Obs. II, 9.—KÜSTER (*Limnæus*) in Ch. ed. 2, 38, pl. vii, f. 5.

Limnæa plebeia, GOULD? (see below).

Limnæa expansa, HALDEMAN, Mon. 29, pl. ix, f. 6–8 (1842); Suppl. to part I, p. 3 (1840).—DEKAY, N. Y. Moll. 75, pl. xxxvi, f. 348 (1843). —KÜSTER (*Limnæus*) in Chemn. ed. 2, 39, pl. vii, f. 6, 7.

Ranging from New England, through Pennsylvania and Kansas, to California and Oregon. Very numerous in British America, reaching a high latitude, as shown by specimens from Hudson's Bay and Fort Resolution.

Mr. Say suggests the identity of *L. elodes* with the European *L. palustris*. I have no doubt of it, the species being one of the circumpolar forms common to the three continents. I have given the original description above, and Fig. 60 is a fac-simile of one of Say's. It is a very variable species, sometimes scarcely to be distinguished from *L. reflexa*, as remarked under that species (p. 39). *Limnæa plebeia* is also referred to under *L. reflexa* (p. 40). Dr. James Lewis unites *L. catascopium* and *L. emarginata* to *L. elodes*.

Fig. 61.

Limnæa palustris.

Limnæa nuttalliana appears to me a form of this species. My opinion is based on a careful examination of specimens so labelled by Mr. Lea. The original description here follows, and a drawing of the original specimen. So little does this figure (62) correspond with *L. palustris* that, judging by it alone, I should be inclined to reverse my opinion of the identity of *nuttalliana* with *palustris*. It is one of the points to which attention must be directed. No. 8256 and 8257 were labelled *L. nuttalliana* by Mr. Lea. One of them is here figured (Fig. 61). No. 8318 and 8474 are also this form.

Limnæa nuttalliana.—Shell ovately conical, rather thin, striate, subdiaphanous, pale brown, imperforate; spire rather short; apex red;

[1] *L. fragilis*, of Linnæus, is synonymous with *L. stagnalis*.

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sutures impressed; whirls six, convex; aperture ovate, inflated, banded within.

Fig. 62.

Limnæa nuttalliana.

Oregon. My cabinet and cabinets of Prof. Nuttall and Dr. Jay. Diam. .50, length .95 inch.

A fine, rather robust species, rather resembling *L. elodes*, Say, but shorter and more inflated, and having a larger and more curved fold. The aperture is rather more than one-half the length of the shell, and is retuse at the lower part. Under the lens may be observed very minute revolving striæ. The band within the aperture is removed from the edge of the lip, and is broad and brown. The lip is not reflected. (*Lea.*)

A recent visit to Prof. Haldeman has enabled me to examine the two original specimens, the only ones known, from which were drawn the description of *Limnæa expansa.* Believing them accidental variations only, I add them to the synonymy of *Limnæa elodes.* The Oregon specimen, 8573 of the collection, most nearly resembles this form. A fac-simile of Haldeman's figure and a copy of his description here follow :—

Limnæa expansa.—Shell short, smooth, translucent, and fragile; body whirl inflated; spire as long as the aperture, and rapidly attenuated to an acute apex; whirls five, somewhat flattened; suture shallow, but very distinct, aperture effuse; fold on the columella deep and distinct. Color brownish ochre-yellow.

Fig. 63.

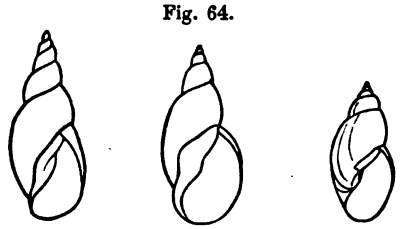
Limnæa expansa.

Found only in Vermont.

I owe the opportunity to describe this new species to Dr. Gould, who gave me specimens, and the information that they are from Vermont. It differs from *L. elodes* in having a polished surface, expanded aperture, obsolete lines of growth, translucency, and a deeper fold upon the columella. It cannot be confounded with any other species. (*Haldeman.*)

It must constantly be borne in mind that I cannot pretend at this time to speak very positively in regard to the synonymy of the North American Limnæidæ. My conclusions are the best I can arrive at with my present material. It is a point to be decided in future whether *L. nuttalliana* and *L. expansa* are synonyms of *L. palustris.* The forms referred to this species are shown at one view in Fig. 64.

Fig. 64.



L. elodes. *L. expansa.* *L. nuttalliana.*

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Fig. 65 will be of interest, as it is copied from Moquin-Tandon's figure of *Limnæa palustris* of France.

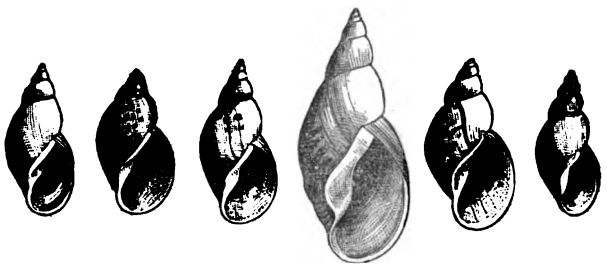
Reeve points out the strong resemblance, if not identity, of the European and American shells.

Fig. 66 represents some of the forms of this variable species which are represented in the Smithsonian collection.

Fig. 65.

Limnæa palustris.

Fig. 66.



Varieties of *Limnæa palustris.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8123	8	Monterey, Cal.	.....	.....
8123	6	Interior Oregon.	Com. Wilkes.	.....
8269	6	Yellowstone River.	Col. Vaughan.	.....
8271	8	Mohawk, N. Y. [Wis.	Dr. J. Lewis.	.....
8272	8	Oskosh, L. Winnebago,	A. C. Barry.	.....
8273	5	Fairhaven. Vt.	Dr. J. Lewis.	.....
8274	4	Marietta, O.	W. Holden?	.....
8275	2	Lake Winnipeg.	R. Kennicott.	.....
8276	13	Scarboro', Me. [wego.	Dr. J. Lewis.	.....
8277	1	Four Mile Creek, Os-	.....	.....
8278	6	Roxbury, Mass.	Dr. J. Lewis.	.....
8279	6	Nimahaw River, K. T.	Wm. T. Magraw.	.....
8280	10	Summer Lake, O.	.....	.....
8281	16	Near Chimney River.	Wm. T. Magraw.	"Swamps."
8282	9	Mohawk, N. Y.	Dr. J. Lewis.	.....
8283	14	Grand Rapids, Mich.	..... [land.	.....
8284	20	Sing Sing, N. Y.	Rev. R. J. W. Buck-	.....
8285	14	Mohawk, N. Y.	Dr J. Lewis.	.....
8286	2	Lake Winnipeg.	R. Kennicott.	.....
8287	2	Milwaukee, Wis.	I. A. Lapham.	.....
8288	6	Port Huron, Mich.	Prof. S. F. Baird.	"*umbrosa*," I. Lea.
8289	14	Grindstone Creek.	.....	.....
8290	2	Lake of the Woods.	R. Kennicott.	.....
8291	23	Grindstone Creek.	.....	.....
8464	50	Platte Riv. at Ft. Kear-		[hol.
		ney, Neb. [get Sound	Capt. J. H. Simpson.	With animal in alco-
8467	28	Chilencynck Depot, Pu-	A. Campbell.	" "
8477	5	Grand Rapids, Mich.	.....	.....
8568	2	Pacific Coast.	.....	.....
8735	12+	San Francisco.	Rowell.	In alcohol.
8736	4	Clear Lake, Cal.	Dr. Veatch.	.....
8739	2	San Francisco.	Rowell.	.....
8953	6	Ft. Simpson, Br. Am.	R. Kennicott.	.....
8573	1	Oregon.	.....	(*expansa*, Hald?)
8958	..	Ft. Resolution.	R. Kennicott.	.....
9072	20+	"	"	.....
9073	20+	"	"	.....
9136	20+	"	"	.....

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9138	10	Mohawk, N. Y.	Dr. Lewis.	.....
9176	30+	Vermont.	J. R. Chittenden.	.....
9180	10	Lynn, Mass.	Dr. Prescott.	.....
8256	16	Apple Creek, lat. 47°.	.....	*nuttalliana*, teste Lea.
8257	4	Big Sioux.	.....	" "
8318	50	Mo. of the Yellowstone.	.....	" "
8474	1	Big Sioux.	.....	" "
9286	1	Otter Tail Creek, Min.	.....	.....
9288	15	Upper Mackenzie.	.....	.....
9291	11	Great Slave Lake.	.....	.....
9237	5	Wright's L., Cal.	.....	*nuttalliana*, teste Lea.
9239	4	Klamath Marsh, O.	Dr. J. S. Newberry.	" "
9246	1	Rhett L., Cal.	.....	" "
9241	8	Benicia. [pine.	Dr. J. S. Newberry.	.....
9289	20	Yukron, mo. of Porcu-	R. Kennicott.	.....

Limnæa proxima, LEA.—Shell acutely conic, rather thin, closely and irregularly striated, horn-colored, minutely perforated; spire sub-elevated, sharpened at the apex; sutures deeply impressed; whirls seven, convex; aperture sub-inflated, sub-elliptical, banded within, columella slightly plicate.

Fig. 67.

Limnæa proxima.

Arroya San Antonio, California: Dr. Trask. (*Lea.*)

Limnæa proxima, LEA, Proc. Ac. Nat. Sc. Phila. VIII, 80 (1856).

The above is Mr. Lea's description. Fig. 67 is drawn from No. 9204 of the collection, determined by him. The rapid enlargement of the whirls in width appears to be the chief characteristic of this species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9204	4	San Francisco.	Judge Cooper.	Authentic—one fig'd.
9195	..	California.	"	Named by I. Lea.

Limnæa desidiosa, SAY.—Shell oblong sub-conic; whirls five, very convex, the fourth and fifth very small, the second rather large, suture deeply indented; aperture equal to or rather longer than the spire; labium, calcareous deposit copious, not perfectly appressed at base, but leaving a very small umbilical aperture.

Fig. 68.

Limnæa desidiosa.

Inhabits Cayuga Lake. Length 7-10 of an inch.[1]

Found by Mr. Augustus Jessup. It is closely allied to *L. elodes*, but the whirls are more convex, one less in number, and the two terminal ones are proportionally smaller; the callus of the labium, also, near its inferior termination, is applied still more closely to the surface of the body whirl. (*Say.*)

Limnæa desidiosa, SAY, Journ. A. N. S. II, 169 (1821); Long's Ex. II,

[1] See remarks under *L. humilis.*

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263; Am. Conch. VI, pl. l, f. 5; ed. Binn. 66, pl. lv, f. 3.—Adams, Shells of Vermont, 154 (1842).—DeKay, N. Y. Moll. 73, pl. v, f. 78 (1843).—Küster in Ch. ed. 2, 47, pl. viii, f. 22–26 (*Limnæus*).—Gould, Inv. of Mass. 219, f. 150 (1841).—Haldeman, Mon. p. 31, pl, x; p. 48, pl. xiii, f. 16–18 (1842).—Anony. Can. Nat. II, 198, fig. (1857).

Limnæa acuta, Lea, Tr. Am. Phil. Soc. V, 114, pl. xix, f. 81 (1837); Obs. I, 226.

Limnæa obrussa, Say, J. A. N. Sc. V, 123 (1825); Binney's ed. 113.—DeKay, N. Y. Moll. 75 (1843).

Limnæa philadelphica, Lea, Proc. Am. Phil. Soc. II, 32 (1841); Tr. IX, 8 (1844); Obs. IV, 8.

Limnæa fusiformis, Lea, Pr. Am. Phil. Soc. II, 33 (1841); Tr. IX, 10 (1844); Obs. IV, 10.

From New England to Kansas.

An authentic specimen of *L. desidiosa*, in the Academy's collection, is drawn somewhat larger than nature in Fig. 68.

Mr. Haldeman places *L. obrussa* in the synonymy of *L. desidiosa*. Say's description here follows, and a drawing of an authentic specimen from the Academy at Philadelphia.

Limnæa obrussa.—Shell oblong, rather slender, pale yellowish testaceous; whirls five, slightly rounded; apex acute; suture deeply impressed; aperture not dilated, within pure white; columella with the sinus of the fold very obvious (*Lister*, pl. 114, f. 8?). Total length nine-twentieths of an inch; aperture one-fourth; breadth nearly one-fifth.

Fig. 69.

Limnæa obrussa.

All the individuals that have occurred were covered with an earthy slime. They inhabit a small rivulet below the fish-ponds at Harrowgate, the seat of my friend Mr. J. Gilliams. (*Say.*)

The descriptions of *L. philadelphica*, *fusiformis*, and *acuta* here follow, as well as figures of them drawn from Mr. Lea's original specimens, excepting *L. acuta*, which is copied from his original figure. Haldeman and DeKay both place *L. acuta* in the synonymy of *L. desidiosa*. Specimens labelled *L. philadelphica*, by Mr. Lea, are in the Smithsonian collection from the Yellowstone River. Küster, *l. c.*, places *obrussa*, *acuta*, and *philadelphica* in the synonymy.

Haldeman refers doubtfully *L. casta* to this species. It appears to me, however, rather a synonym of *L. columella*.

The name *L. fusiformis* is preoccupied by Sowerby (Min. Conch. II, 155, pl. clxix, 1818).

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Limnæa acuta, LEA.—Shell elevated, turreted, thin, smooth, dark-brown; spire attenuate; whirls six, aperture subovate.

Fig. 70.

Limnæa acuta.

Pond four miles north of Philadelphia. Diam. .3, length .7 inch.

This delicate species, though attenuate, is not so much so as the *exilis*, herein described. Its whirls are more convex and the body whirl larger, the aperture being about one-half the length of the shell. Several specimens were found by me, some years since, in a very small pond near the Falls of Schuylkill. Since then this pond has occasionally dried up, and I have not been able to find others. Although there are other ponds near to this, which other species inhabit, I have never been able to discover the *acuta* in any other spot. (*Lea.*)

Limnæa philadelphica, LEA.—Shell ovately-conical, thin, striated, shining, diaphanous, rather golden, imperforate; spire rather elevated; sutures much impressed. whirls five, convex; aperture narrow-elliptical.

Fig. 71.

Limnæa philadelphica.

Hab. River Schuylkill, near Philadelphia. My cabinet and cabinets of P. H. Nicklin, and Dr. Griffith. Diam. .20, length .48 of an inch.

This species is about the size of, and is allied to *plica* and *griffithiana*, herein described, and to *modicella*, Say. It has a more elongated aperture than *griffithiana*, has a smaller fold than *plica*, and is higher in the spire than *modicella*. The aperture is about half the length of the shell. I procured many specimens west of Philadelphia. Dr. Griffith informs me that he found them south of the city. (*Lea.*)

Limnæa fusiformis, LEA.—Shell fusiform, rather thick, closely striate, pale yellow, imperforate; spire rather short; sutures slightly impressed; whirls six, flattened; aperture narrow-elliptical.

Fig. 72.

Limnæa fusiformis.

Hab. Niagara River, Lewistown, New York: Tobias Wagner. My cabinet, and cabinets of P. H. Nicklin, and Tobias Wagner. Diam. .35, length .60 of an inch.

Among a number of interesting shells collected by T. Wagner, during a long journey in the interior of our country, were several specimens of this species, which has not been, I believe, before noticed. It is found with, and is somewhat allied to, *L. desidiosa*, Say. It differs in being more fusiform, having a larger aperture, and flatter whirls, and in being imperforate. It is about the size of, and resembles, *L. casta*, herein described. It differs in being less elevated in the spire, in the whirls being more flattened, in having a distinct and curved fold, and in being imperforate. The aperture is nearly two-thirds the length of the shell. The last two whirls are disposed to be wrinkled. (*Lea.*)

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Fig. 73.

L. desidiosa. *L. philadelphica.* *L. acuta.* *L. obrussa.* *L. fusiformis.*

Fig. 73 gives, at one view, the forms which I have referred to the synonymy of this species.

Fig. 74 represents the European representative of *L. desidiosa.* It is copied from Moquin-Tandon's figure of *L. truncatula.*

Fig. 74.

Limnæa truncatula.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8310	4	Minnesota.	I. A. Lapham.	.....
8311	11	Grand Rapids, Mich.	Dr. J. Lewis.	.....
8312	8	" "	"	.....
8313	34	Apple Creek, lat. 47°.	.....	.....
8314	4	Loup Fork.	.....	..... [sil.
8315	8	.....	Dr. J. Lewis.	Calcareous tufa. Fos-
8316	36	Mohawk, N. Y.	"	.....
8317	29	Westbrook, Me.	"	.....
8470	25	Mohawk, N. Y.	"	Alcohol.
8476	1	.....	W. G. Binney.	.....
8526	4	Yellowstone River.	Dr. F. V. Hayden.	Cabinet series. [Lea.
8951	2	.....	.....	*philadelphica*, teste

Limnæa emarginata, Say.—Shell rather thin, translucent; volutions four, very convex; body whirl large; suture deeply impressed, spire somewhat eroded; mouth two-thirds of the length of the shell. Length nearly four-fifths of an inch; of the mouth, half an inch.

Fig. 75.

Limnæa emarginata.

Inhabits lakes of Maine.

This species was discovered by Mr. Aaron Stone. It is a rather larger and considerably wider shell than *L. catascopium*, and the emargination visible on a profile view of the umbilical groove is far more profound. In general obesity it has a resemblance to *L. inflatus*, Brong. It was first sent to me by Mr. Aaron Stone, from the lakes of Maine. Dr. Bigsby presented me with a specimen which he obtained in Upper Canada; and I have recently received several from Mr. Titian Peale, also found in Maine, one of which is double the size of the figure represented in our plate 55, fig. 1. (*Say.*)

Limnæa emarginata, Say, Journ. Acad. Nat. Sc. II, 170 (1821); Long's Ex. II, 63; Amer. Conch. VI, pl. lv, f. 1 (1834).—Binney's ed. 67, 211, pl. lv, f. 1.—Haldeman, Mon. 10, pl. ii (1841).—DeKay, N. Y.

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Moll. 73, pl. iv, f. 77 (1843).—KÜSTER in Ch. ed. 2, 44, pl. viii, f. 8–10 (*Limnæus*).

Limneus ontariensis, MUHLFELDT in KÜSTER.

Limnæa serrata, HALDEMAN, *l. c.*

It is said to have been found from New England to Washington Territory.

Considerable doubt exists regarding this variable shell, and its identity with *L. catascopium*. It is referred to that species by Stimpson (Shells of N. E. 32) and Gould (Lake Superior). Subsequently it has been referred to *L. elodes*, by Lewis (Boston Proc. V, 122). I have, therefore, given several figures of it in addition to the description of Mr. Say, leaving the question of its specific weight to be decided when more material has been collected. Fig. 75 is a copy of Mr. Say's original figure in the American Conchology. Fig. 77 is copied from one of Haldeman's, drawn from an authentic specimen of Mr. Say. A larger, better developed form, presented to the Smithsonian (No. 9144), by Prof. Haldeman, is drawn in Fig. 78; while a somewhat peculiar form is copied from Haldeman in Fig. 78. He suggests for it the name *L. serrata*, should it prove distinct, and describes it as characterized by elevated lines and undulating peritreme.

Fig. 76.

Limnæa emarginata.

Fig. 77.

Limnæa emarginata.

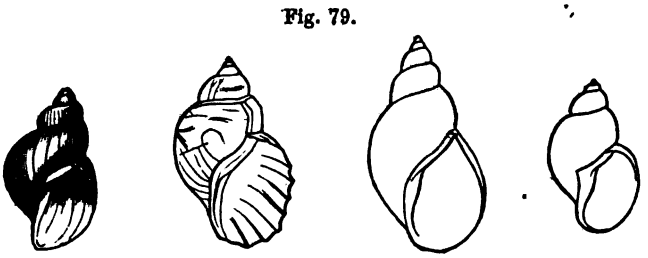
Fig. 78.

Limnæa emarginata.

Küster, *l. c.*, places in the synonymy of *emarginata* a var. A, *L. ontariensis*, Muhlf. in litt., with an ovate-conic shell, acuminate, whirls convex, the last ovate, aperture semioval.

Fig. 79 gives, at one view, the various forms of *L. emarginata*.

Fig. 79.



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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8302	5	Madison, Wis.	I. A. Lapham.	.....
8303	5	Lake Winnipeg.	R. Kennicott.	.....
8304	54	.....	.....	.....
8305	9	.....	Dr. J. Lewis.	.....
8480	3	.....	.....	Cabinet series.
9123	8	Wisconsin.	Dr. J. Lewis.	.....
9144	1	.....	Prof. Haldeman.	(Fig. 76.)
9161	2	Owasco Lake, N. Y.	Mrs. H. W. Parker.	.....
9166	1	Madison, Wis.	I. A. Lapham.	.....
9183	1	.....	Gen. Totten.	.....
9253	4	Lake Superior.	Newberry.	.....
9284	11	Otter Tail Creek, Min.	Kennicott.	.....

Limnæa catascopium.—Shell thin, horn-color, red, or blackish; whirls four or five, the first large and generally the remainder darker and rapidly decreasing to an acute apex and wrinkled across; aperture large, oval, not three-fourths the length of the shell. Length seven-tenths of an inch; breadth nearly one-half of an inch.

Fig. 80.

Limnæa catascopium.

Fig. 81.

Limnæa catascopium.

Inhabitant yellowish, sprinkled with small, often confluent, paler dots; tentacula two, broad, pyramidal; eyes black, placed at the base of the tentacula; tail obtuse, rounded or emarginate, not so long as its shell. Pl. 2, fig. 3.

It is with much hesitation that we adopt a new specific name for this shell, having always heretofore considered it the same as the *L. putris* of authors (which has been, perhaps, mistaken for the *Helix limosa* of Linné). As far as we can ascertain, the principal difference appears to be in the more oblique revolution of the whirls in the European species, and the more abrupt termination of the spire.

Inhabits the Delaware River and many other waters of the United States, in considerable numbers, and may be found plentifully, during the recess of the tide, about the small streams through which the marshy grounds are drained, in company with several other shells. When kept in a vessel of water, like others of its kind, it will proceed not only up the sides of its prison, but also along the surface of the water, the shell downward, with regularity of motion and apparent ease. In this case the reverted base of the animal is concave; and as the surface of the water is compelled to a corresponding concavity, the pressure of the atmospheric column will account for the sustentation of the animal (whose specific gravity is much greater than that of the water) in this singular position. It occasionally crawls to the margin of the water to inhale a supply of air; with this object the foramen is protruded to the surface, and opened with an audible snapping sound, similar to that produced by the resilience of the nib of a pen.

Fig. 82.

L. catascopium.

Its European analogue is the *L. peregrum*, L., from which it may be distinguished by a deeper fold of the columella,

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and a more acute curvature of the inferior portion of the aperture. Pl. 55, fig. 2. (*Say.*)

Limnæa catascopium, Say, Nich. Ency. pl. 11, f. 3 (1817, 1818, 1819); Am. Conch. VI, pl. lv, f. 2 (1834); ed. Binney, 45, 211, pl. lxx, f. 3; pl. lv, f. 2.—Haldeman, Mon. 6, pl. i (1841).—Gould, Inv. of Mass. 223 (1841).—DeKay, N. Y. Moll. 67, pl. vi, f. 80 (1843).—Mrs. Gray, Fig. Moll. An. cccx, f. 7.—Küster in Ch. ed. 2 (*Limnæus*), 46, pl. viii, f. 15–21.—Potiez et Michaud, Gal. des Moll. I, 216, pl. xxi, f. 3–4.—Anon. Can. Nat. II, 201, fig. (1857).

Limnæa cornea, Valenciennes, Humb. & Bonpl. Rec. 1833, II, 251.

Limnæa pinguis, Say, J. A. N. Sc. V, 123 (1825); ed. Binney, 114 (not of Dohrn, Pr. Zool. Soc. 1858, 134).

Limnæa virginiana, Lamarck, An. s. Vert. VI, 160.—Deshayes in Lam. 8, 411; ed. 2, III, 416; Enc. Meth. Vers, II, 362 (1830).—Delessert, Rec. des Coq. xxx, 4 (1831).

Limnæa sericata, Ziegler, teste Haldeman.

Helix catascopius, Eaton, Zool. Text-Book, 195 (1826).

This species is exceedingly abundant in the Delaware River. [illegible]207 of the collection shows some of its variable forms. It [illegible]n noticed from New England to Lewis River, and [illegible]gh latitudes in the British Possessions.

Limnæa pinguis, Say, is still represented by authentic specimens in the Academy's collection, one being drawn in my Figure 83. Say's description is given below. Mr. Haldeman agrees with me, and DeKay doubtfully places it in the synonymy of *L. catascopium*.

Limnæa pinguis, Say.—Shell oval, rather ventricose, pale dirty-yellowish; whirls nearly four, rapidly diminishing to the apex, which is dull fulvous; suture moderate, spire rather more than half the length of the aperture; aperture large; labrum with the inner margin a little thickened. Total length eleven-twentieth, aperture rather more than seven-twentieth, breadth seven-twentieth inch.

Fig. 83.

Limnæa pinguis.

Proportionally shorter and much more dilated than other species of the country, with the exception of *L. macrostomus*, from which it is readily distinguished. It inhabits the Delaware and Schuylkill Rivers near Philadelphia, in company with *L. catascopium*. (*Say.*)

Limnæa cornea is referred to *L. catascopium* by Haldeman and Gould, and also by Ferussac (Bull. Zool. 1835, 33). I have seen no authentic specimen, but give a translation of the original description below.

Limnæa cornea, Valenciennes (*l. c.*).—Shell ovate-conic, thin, subpellucid; whirls five, lightly striate; aperture not expanded.

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This little *Limnæa* is but slightly ventricose; the aperture is hardly as large as in the following species (*L. navicula*). The height of the last whirl is double that of the four other whirls taken together. Whirls with fine striæ parallel to the right lip. Aperture oval, its vertical diameter equalling two-thirds of that of the last whirl; breadth only one-half the length.

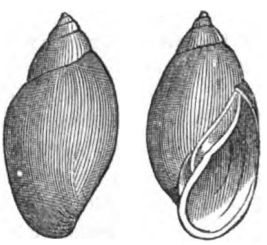
Color yellowish horn. Length 9 lines. Environs of Philadelphia. (*Valenciennes.*)

I have seen no authentic specimen of *L. virginiana*, and should hardly refer it to this species. It is, however, doubtfully placed in the synonymy by Haldeman. The original description of Lamarck and figures of Delessert here follow. It is referred to *L. columella* in Beck's Index. Dr. Gould tells me that specimens of *L. columella*, in the Leyden Museum, are labelled *L. virginiana*.

Limæa virginiana, LAMARCK.—Shell ovate-ventricose, very thin, diaphanous, longitudinally wrinkled, grayish; whirls five, the last longer than the spire; labrum turned backwards.

Hab. Fresh-waters of Virginia. Its thinness renders it very fragile. 15 lines long. (*Lamarck.*)

Fig. 84.



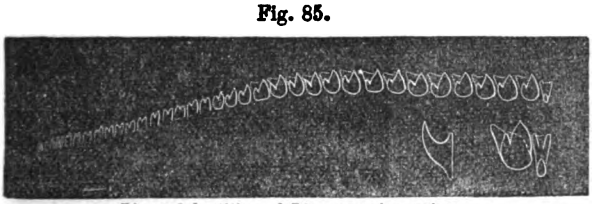
Limnæa virginiana.

In addition to the synonymy already given above, Haldeman and DeKay refer to this species *L. decollata* (*q. v.*). Lewis (Bost. Proc. VI, 122) places *L. catascopium* and *emarginata* in the synonymy of *L. elodes*. Küster, *l. c.*, quotes, as synonyms of *L. catascopium*, the following: *L. pinguis*, *L. cornea*, *L. virginiana*.

Fig. 80 and 82 are fac-similes of those of Mr. Say. Fig. 81 is from a specimen taken in the Delaware River.

The lingual dentition of *Limnæa catascopium* is figured in Fig. 85. There are 105 rows of teeth, 34 laterals in each row.

Fig. 85.



Lingual dentition of *Limnæa catascopium*.

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Fig. 86 represents specimens in the collection, some of which bear a resemblance to forms of *L. catascopium*, though the more globose among them would hardly be referred to that species. So variable are the species of this genus that I have hesitated in proposing a specific name for them. They were collected by Dr. Hayden, at Grindstone Creek (No. 8304 of collection).

Fig. 86.

Limnæa catascopium?

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8308	7	Delaware River.	.....	.....
8309	31	Mohawk, N. Y.	.....	.....
8478	3	Delaware River.	Dr. J. Lewis.	Cabinet series.
9133	50	Erie Canal.	"	.....
9035	100	Moose Factory.	Drexler.	.....
8975	..	Lake Utah.	Capt. Burton.	.....
9134	20+	.....	Dr. J. Lewis.	.....
9207	20	Delaware River.	Binney.	.....
9329	2	Halifax.	W. Stimpson.	.....

Limnæa caperata, SAY.—Shell suboval, a little oblong, obscurely yellowish-horn color; spire half the length of the mouth; apex acute; whirls slightly wrinkled across, and with very numerous, equal, subequidistant, elevated, minute, revolving lines; suture not very deeply impressed; aperture rather dilated; fold of the labium not profound.

Fig. 87.

Limnæa caperata.

Inhabits Indiana.

The remarkable character of this species consists in the numerous revolving lines with which the surface is marked, but these are so minute as to require the aid of a magnifier to bring them to view. It was found on land subject to inundation, near New Harmony, by Dr. Troost. (*Say.*)

Limnæus caperatus, SAY, New Harmony Diss. II, 230 (1829); Descr. 23; BINNEY'S ed. 148; KÜSTER in Ch. ed. 2, 47, pl. viii, f. 27–30.

Limnæa caperata, HALDEMAN, Mon. 34, pl. xi, f. 1—9 (1842).—ADAMS, Shells of Vermont, 154 (1842).—DEKAY, N. Y. Moll. 69, pl. iv, f. 66, 69; pl. v, f. 79 (1843).—MRS. GRAY, Fig. Moll. An. pl. cccx, f. 8.

Limnæa umbilicata, ADAMS, Am. Journ. Sc. [1], XXXIX, 374 (1840); Boston Journ. Nat. Hist. III, 325, pl. iii, f. 14 (1840).—GOULD, Invert. of Mass. 218, f. 149 (1841).

This species is found in the British Possessions as far north as Hudson's Bay, and through the northern tier of States from New England to Lake Superior. The form known as *L. umbilicata* is found along the northern tier of States to Michigan, has been

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quoted from Louisiana, catalogued by Adams from Jamaica, and placed by Poey in the synonymy of *L. cubensis*, Pfr.

No. 8429 of the collection has Prof. Adams's label "*L. umbilicata.*" I follow Haldeman and Küster in considering it a synonym of *L. caperata*, giving below a copy of Adams's figure and description.

Limnæa umbilicata.—Shell rather strong, brown, ovate, with slight striæ of growth, and more slight, numerous, irregular, revolving, impressed lines; whirls five, convex; suture deeply impressed; spire two-fifths of the length of the shell, conic, subacute at the apex, angle of its opposite sides about 65°; body whirl inflated, subglobular; aperture ovate, its plane, also the line of its length at angles of about 15° with the axis of the shell, three-fifths as long as the shell; labrum thin, inner margin dark-brown, inner submargin thickened with a light pink deposit; columella strong, reflected and spread over an umbilicus, which is rather large, but not profound, and formed chiefly by the reflection of the columella; fold of the latter inconspicuous. Length .28, breadth .17 inch. Cabinets of the Boston Soc. Nat. Hist., of Middlebury College, of Mr. Shiverick, and my own. New Bedford.

Fig. 88.

Limnæa umbilicata.

For this species I am indebted to Mr. Shiverick, who obtained numerous specimens. It resembles *L. caperatus*, Say, but in Say's species the aperture is but one-half the length, the revolving lines are raised, more distinct and numerous, the umbilicus is rather less, and there is one more whirl. (*Adams.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8291	11	Mohawk, N. Y.	Dr. J. Lewis.	.....
8292	1	Goose Island, Mich.	.....	.....
8293	18	New York.	Dr. J. Lewis.	.....
8464	6	.....	.....	Cabinet series.
9071	2	Hudson's Bay.	Drexler.	.....
8247	6	Milwaukee, Wis.	I. A. Lapham.	.....
8248	7	Westfield, Mass.	Dr. J. Lewis.	.....[Adams.
8249	3	.....	W. G. Binney.	*umbilicata*, teste

Limnæa vahlii, Beck & Möll.—Shell ovate-oblong; spire convex-conic, rather obtuse; whirls about six; suture somewhat deep; aperture longer than a half the length of the shell. Length 9‴. (*Möller.*)

Fig. 89.

Limnæa vahlii.

Limnæa vahlii, Möller (1842), Ind. Moll. Gr. 4.—Küster in Ch. ed. 2, 27, pl. v, f. 8–10.

Limnophysa vahlii, Beck, teste Möller.

From a specimen received from Möller, and deposited in the collection, Fig. 89 was drawn. The species is

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given by name only in Rink's Greenland, p. 76, by Mörch, with the following varieties:—

Var. *α. nitens* (*L. pingellii*, Bk. & Möll).
Var. *β. leucostoma* (*L. grönlandica*, Jay's Cat.)
Var. *γ. malleata.*
Var. *δ. parva*; peristome often unattached, with an elevated parietal line. (*Mörch.*)

Of these synonyms, *Limnæa grönlandica* is unknown to me. I find no description of it, though it is mentioned by name in Beck's Index Moll. Gr. p. 4, and by Mörch, Moll. Grön. p. 70.

Fig. 90 is drawn from an authentic specimen of *L. pingelii*, in the collection of the Smithsonian Institution. I have given Möller's description below, with a separate synonymy and museum register, in case it should have erroneously been placed in the synonymy of *L. vahlii.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8816	2	Greenland.	.....	Cabinet series. Fig. 89.

Fig. 90.

Limnæa pingelii.

Limnæa pingelii, Beck.—Shell ovate-elongate; spire conic, rather acute; whirls five; suture deep; aperture shorter than half the length of the shell; narrowly rimate. Length 6, 5‴. (*Möller.*)

Limnæa pingelii, Beck, Möller, Ind. Moll. Gr. 5 (1842).—Küster, Ch. ed. 2, 27, pl. v, f. 11, 12.
Limnophysa pingelii, Beck, teste Möller.
Limnæa vahlii, Mörch, pars, Rink's Gr. 76.

Greenland (see last species).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8817	1	Greenland.	.....	Cabinet series. Fig. 90.

Limnæa wormskioldii, Mörch.—Intermediate species. Shell umbilicate, very solid; spire elongate, acute; suture deep; aperture semilunar; peristome sometimes disconnected. (*Mörch.*)

Limnæa wormskioldii, Mörch, Moll. Grönl. 76 (Rink's Greenl.).

I can find no fuller description or any further information regarding this species.

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Limnæa holbollii, Beck & Möll. (Index Moll. Gr. 5 (1842).—Mörch, Moll. Gr. 76.

Fig. 91.

I can find no description of this species. Fig. 91 is drawn from a specimen in the collection received from Möller.

Limnæa holbollii.

Since writing the above I have met with a figure of the species in Küster, Chemn. ed. 2, 28, pl. v, f. 13–15, and the following description :—

Shell broadly rimate, ovate conic, rather thin, shining, horn-colored, striate; spire conical, truncated, suture rather profound, whirls convex; aperture ovate, shorter than one-half of the shell's length; peristome straight, its columellar termination white, with an obsolete fold. Height 5–6‴; breadth 2½–3‴. (*Küster.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8515	3	Greenland.	.....	Cabinet series. Fig. 91.

Limnæa adelinæ, Tryon.—Shell thin, semi-transparent, body whirl large, wide, convex; spire small, consisting of five convex volutions, attenuating rapidly to an acute apex, sutures impressed; inner lip thin, reflected, but not covering the umbilical fissure, which is narrow; columella twisted; color light horn, polished within the aperture, outer lip tinged with red within. Length 14, greater diameter 8½; of aperture, length 9, breadth 5 mill.

Fig. 92.

Limnæa adelinæ.

San Francisco, California: Rev. J. Rowell. My cabinet and cabinet of Mr. Rowell.

This shell is nearly allied to *L. catascopium*, Say, and perhaps more nearly to *L. intermedia*, Mich., of Europe. From the former it may be distinguished by being more fragile, more transverse, with a smaller, more rapidly attenuating spire, but principally by the presence of an umbilical fissure, which in *catascopium* is entirely concealed by the appression of the labium. In this and other respects it is very near to *L. intermedia*, which, however, has a shorter spire, of fewer volutions. I name this species after my sister, Miss Adeline S. Tryon, who has evinced much interest in conchological pursuits. (*Tryon.*)

Limnæa adelinæ, Tryon, Proc. Phila. A. N. S. 1863, 149, pl. i, f. 12.

The original description and figure are copied above.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9335	4	Piscados, Cal.	G. W. Tryon.	.....

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Limnæa vitrea, HALDEMAN.—Shell ovate, extremely thin and delicate; surface smooth and polished; lines of growth very fine; aperture ample: the labium presents a well marked fold, and is not appressed anteriorly; spire short.

Fig. 93.

Limnæa vitrea.

Ohio? Missouri?

Foreign analogue, *L. tenuis*, Bronn.

This species presents us with a shell which is probably thinner in texture than that of any other we have. For the specimens figured I am indebted to Mr. G. B. Emerson, President of the Boston Society of Natural History. (*Haldeman.*)

Limnæa vitrea, HALDEMAN, Mon. pt. 4, cover, p. 3; p. 47, pl. xiii, f. 14, 15 (1842).—DEKAY, N. Y. Moll. 75 (1843).

Fig. 93 is copied from Haldeman, whose description is given above.

Limnæa traskii, TRYON.—Shell elongated, the spire drawn out and apex acute; whirls six, convex, almost shouldered, sutures deeply impressed; aperture small, oval, labrum well rounded, labium slightly rounded, not appressed below, not covering the umbilicus, which, though small, is very distinct. Color light horn or cinereous. Length 16, diam. 8; of aperture, length 7, diam. 5 mill.

Fig. 94.

Limnæa traskii.

Mountain Lake, California: Rev. J. Rowell. My cabinet, and cabinet of Mr. Rowell.

At first I was disposed to regard this shell as a variety of *L. proxima*, Lea, but a comparison with the type specimens of that species shows the following differences: the volutions are not so oblique, and are more rounded, the aperture is also more rounded, and the shell is umbilicated. Named in honor of Dr. J. B. Trask, one of the pioneers of Californian Conchology. (*Tryon.*)

Limnæa traskii, TRYON, Proc. Phila. A. N. S. 1863, 149, pl. i, f. 13.

The above are copies of the original description and figure of this species.

Limnæa pallida, ADAMS.—Shell moderately elongate, ovate-fusiform, very pale horn color, semi-transparent, not very thin, with fine, irregular striæ of growth, without revolving striæ; whirls about five and a half, moderately convex; suture well impressed; spire four-ninths of the length of the shell, acutely conic, its opposite sides containing an angle of about 45°, subacute at tip; body whirl not much enlarged, somewhat produced below; aperture five-ninths of the length of the shell, subovate-acute above, angle of its plane with the axis of the shell about 15°, of its length with the axis about 10°; labrum not thickened internally;

Fig. 95.

Limnæa pallida.

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fold of the columella distinct, but not very large; umbilicus rather small. Length .48 inch; breadth .22 inch. Cabinets of the Boston Soc. N. H.; of Middlebury College; of Dr. A. A. Gould, of Boston; of J. G. Anthony, of Cincinnati; and my own.

Habitat and station. This species was found in considerable numbers at Storeham, Vt., on the shore of Lake Champlain, clinging to rocks and stones.

This species most resembles *L. acuta*, Lea, of which, however, I have not seen a specimen. That shell, in a very brief description, is said to be delicate, smooth, and dark-brown, while this is rather strong, striate, and of a very pale horn color, in living specimens, like the weathered shells of kindred species. The figure represents the columella of the *acuta* as intruding upon the aperture, which is not the case with this shell. (*Adams.*)

Limnæa pallida, ADAMS, Am. Journ. Sc. [1], XXXIX, 374 (1840); Bost. Journ. Nat. Hist. III, 324, pl. iii, f. 13 (1840); Shells of Vermont, 153 (1842).—HALDEMAN, Mon. 45, pl. xiii, f. 11–13 (1842).—DEKAY, N. Y. Moll. 69, pl. iv, f. 67 (1843).

Found from New England to Michigan, and apparently in California. Mr. Lea quotes it from San Antonio Arroya.

Fig. 95 is a fac-simile of one of Adams's figures, accompanying his description, which is also copied above.

It must not be confounded with *L. pallida*, Guer.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8244	3	.....	.....	.....
8490	1	.....	Phila. Acad. Nat. Sc.	Cabinet series.
8733	11	San Francisco.	Rowell.	.....

Limnæa bulimoides, LEA.—Shell ovately-conical, rather thin, smooth, shining, diaphanous, brownish-yellow, slightly perforate; spire rather short; sutures small, whirls five, slightly convex, aperture ovate.

Fig. 96.

Limnæa bulimoides.

Oregon: Prof. Nuttall. My cabinet, and cabinet of Mr. Nuttall. Diam. .22, length .38 inch.

Among the shells taken by Prof. Nuttall, in his journey over the Rocky Mountains, was this small species, the aperture of which is formed very much like a *Bulimus*. The deposit of the columella is wide, and nearly covers the perforation, which consequently is very small. The aperture is nearly half the length of the shell, and the fold obsolete. Several of the specimens, although the substance of the shell is thin, have the apex eroded, some of the superior whirls being entirely gone. I have not observed this to be the case in other *Limnææ*. (*Lea.*)

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Limnæa bulimoides, LEA, Proc. Am. Phil. Soc. II, 33 (1841); Trans. IX, 9 (1844); Obs. IV, 9.—HALDEMAN, Mon. 44, pl. xiii, f. 9, 10 (1842). —DEKAY, N. Y. Moll. 75 (1843).

To Mr. Lea's original description I have added Fig. 96, copied from an authentic specimen. Among the specimens in the collection Nos. 8525 and 8870 were determined by Mr. Lea.

Found by Dr. Hayden, in his explorations of the Yellowstone, and at several points in the Pacific States.

I have seen specimens strongly resembling *Bulimulus pilula.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8525	6	Grindstone Creek.	.....	Named by I. Lea.
8570	6	Columbia River, near Fort Vancouver.	.....	[Cab. ser. .....
8790	10	San Francisco.	Rowell.	.....

Limnæa solida, LEA.—Shell acutely conical, solid, smooth, horn color; spire rather turreted; whirls five; columella reflected; aperture subovate.

Fig. 97.

Limnæa solida.

Hab. Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet, and cabinet of Prof. Nuttall. Diam. 5-20th, length 8-20th of an inch.

A single specimen of this species was among the shells given to me by Prof. Nuttall. It differs from any species which I know, in being more solid. In this specimen the interior is brownish. (*Lea.*)

Limnæa solida, LEA, Trans. Am. Phil. Soc. VI, 94, pl. xxiii, f. 91 (1839); Obs. II, 94.—HALDEMAN, Mon. 36, pl. xi, f. 10–13 (1842).—DEKAY, N. Y. Moll. 75 (1843).

Limnæa apicina, LEA, Trans. Am. Phil. Soc. VI, 102, pl. xxiii, f. 94 (1839); Obs. II, 102.—KÜSTER in Ch. ed. 2 (*Limnæus*), 48, pl. viii, f. 31–33.

Dr. Gould quotes *L. apicina* from Oregon.

Haldeman places *L. apicina* in the synonymy of *L. solida*, as does also DeKay and Küster. Copies of the descriptions and figures of both species are given.

Limnæa apicina, LEA.—Shell obtusely conical, rather solid, smooth, horn colored; spire rather short; whirls four; columella reflected, aperture subovate.

Fig. 98.

Limnæa apicina.

Hab. Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet, and cabinet of Prof. Nuttall. Diam. .3, length .4 of an inch.

This small species is rather more globose than usual. It is distinguished by a dark apex. Within the outer lip there is a dark-brown band. (*Lea.*)

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8523	11	30 m. w. of Ft. Kearney.	.....	.....

Limnæa humilis, Say. — Shell ovate-conic, thin, translucent, with slight wrinkles; volutions nearly six, convex, terminal one very minute; suture well indented; aperture about equal in length to the spire; labium with an obvious plate of calcareous deposit; a distinct and rather open umbilical aperture; color pale reddish-white or yellowish-white. Total length seven-twentieths inch. Fig. 99.

Inhabits South Carolina.

Limnæa humilis.

Of a dozen specimens sent me by Mr. Elliott, none exceeded the limit here assigned to the species. It differs much from any other species I have seen; a variety of it, sometimes quite black, was found by Dr. McEuen, at Oswego, on the Susquehanna. It may be useful here to remark that, in consequence of a typographical error in the first part of the second volume of this work, the species above described may be confounded with the *desidiosus*. The length of that shell is erroneously stated to be seven-twentieths of an inch, instead of seven-tenths, its true length. (*Say.*)

Limnæa humilis, Say, Journ. A. N. S. II, 378 (1822); Binney's ed. 110. —Haldeman, Mon. 41, pl. xiii, f. 1–8 (1842).—DeKay, N. Y. Moll. 71, pl. iv, f. 71 (1843).

Limnæus modicella, Say, J. A. N. Sc. V, 122 (1825); Binney's ed. 113.—Gould, Inv. of Mass. 218, f. 151 (1841).

Limnæa linsleyi, DeKay, N. Y. Moll. 72, pl. iv, f. 74 (1843).—Linsley, Shells of Conn. Am. Journ. Sc. [1], XLVIII, 282 (1845).

Limnæa parva, Lea, Proc. Am. Phil. Soc. II, 33 (1841); Tr. IX, 11 (1844); Obs. IV, 11.

Limnæa plica, Lea, Proc. Am. Phil. Soc. II, 33 (1841); Tr. IX, 10; Obs. IX, 10 (1844).

Limnæa griffithiana, Lea, *l. c.*, II, 33 (1841); IX, 8 (1844); Obs. IV, 8.

Limnæa planulata, Lea, *l. c.*, II, 33 (1841); IX, 9 (1844); Obs. IV, 9.

Limnæa rustica, Lea, *l. c.*, II, 33 (1841); IX, 10 (1844); Obs. IV, 10.

Limnæa exigua, Lea, *l. c.*, II, 33 (1841); IX, 9 (1844); Obs. IX, 10.

Limnæa curta, Lea, *l. c.*, II, 33 (1841); IX, 11 (1844); Obs. IV, 11.

Ranges from Maine to Georgia, and from Kansas to Lake Superior.

Fig. 99 is drawn from an authentic specimen in the collection of the Philadelphia Academy.

Haldeman places *L. modicella* in the synonymy of *L. humilis*. I have given below the original description and a figure (Fig. 100) of an authentic specimen, also from the Philadelphia Academy

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Limnæa parva is placed doubtfully, by Haldeman, in the synonymy of *L. humilis*. I have so placed it after an examination of the description and the type which is drawn in Fig. 102.

Mr. Lea also quotes *L. exigua* from San Antonio Arroya. No. 8523 of the collection, from the Yellowstone River, is labelled *L. curta*, by Mr. Lea. These and the other species of the same author, given in the synonymy, are all drawn below, the figures being in each case from the original specimen. The original descriptions, also, are given.

Of *L. linsleyi*, also, I give the original description and a facsimile of the original figure.

Limnæa modicella, Say.—Shell blackish, not elongated; whirls rather more than four, convex; suture deeply impressed; apex acute; aperture very regular, the labium and labrum being sub-equally curved; the fold of the columella rather slight. Total length seven-twentieths of an inch, breadth one-fifth; length of the aperture one-fifth.

Fig. 100.

Limnæa modicella.

Smaller than any of the species I have hitherto described. It was found, by Dr. M'Euen, at Oswego, on the Susquehanna River, near the State of New York. (*Say.*)

Limnæa curta.—Shell subturreted, rather thin, shining, subdiaphanous, yellow, perforate; spire elevated; sutures impressed; whirls six, convex; aperture small, elliptical.

Fig. 101.

Limnæa curta.

Hab. Cincinnati, Ohio: T. G. Lea. Poland, Ohio: Dr. Kirtland. My cabinet, and cabinets of T. G. Lea and Dr. Kirtland. Diam. .18, length .32 of an inch.

A very small, erect species, resembling, in the form of the aperture, a *Bulimus*, the fold being scarcely perceptible. In its general outline it resembles a *Paludina* more than most *Limnææ*. In these characters it is allied to *L. bulimoides* herein described. The aperture is rather more than one-third the length of the shell, and the last whirl is wrinkled. The columella is thickened, and reflected over the perforation. (*Lea.*)

Limnæa parva.—Shell subturreted, thin, smooth, diaphanous, horn color, subperforate; spire elevated; sutures impressed; whirls five, convex; aperture elliptical.

Fig. 102.

Limnæa parva.

Hab. Cincinnati, Ohio: T. G. Lea. My cabinet, and cabinet of T. G. Lea. Diam. .12, length .22 of an inch.

This is the smallest species which has come under my notice. In general form it resembles *L. curta*, herein described. It is rather less inflated, has a longer aperture, and is diminutive.

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The perforation, too, is smaller, and the columella more curved. The two specimens before me have the superior whirls black from the deposit of the oxide of iron. The aperture is about half the length of the shell. (*Lea.*)

Limnæa plica, LEA.—Shell turreted, rather thin, yellow, striate, imperforate; spire rather elevated; sutures impressed; whirls five, convex; aperture small elliptical. Fig. 103.

Hab. Tennessee: Dr. Troost. My cabinet, and cabinet of Dr. Troost. Diam. .18, length .38 of an inch.

Limnæa plica.

A small species with a large incurved fold. It resembles *L. exigua*, herein described, in size, but in the form of the columella it is entirely different. The aperture is about half the length of the shell.

Limnæa planulata, LEA.—Shell ovately conical, thin, smooth, subdiaphanous, brown, perforate; spire rather short; sutures impressed; whirls five, convex; aperture small, ovate. Fig. 104.

Hab. White Sulphur Springs, Virginia: P. H. Nicklin. My cabinet, and cabinet of P. H. Nicklin. Diam. .15, length .35 of an inch.

Limnæa planulata.

Several specimens of this small species are before me, one of them considerably larger than the others and possessing one more whirl. The whirls are inflated, but flattened in the middle. This gives a roundness to their superior part. The perforation is small and the fold scarcely observable. The aperture is less than half the length of the shell, and contracted. (*Lea.*)

Limnæa exigua, LEA.—Shell subfusiform, thin, striated, diaphanous, pale yellow, perforate; spire rather short; sutures impressed; whirls five, rather convex; aperture elliptical. Fig. 105.

Hab. Tennessee: Dr. Troost. My cabinet, and cabinet of Dr. Troost. Diam. .15, length .35 of an inch.

Limnæa exigua.

This is a small species about the size of *L. plica*, herein described, and in outline resembling it. It differs, however, altogether, in the columella, which is nearly, and the fold scarcely observable. The aperture is about one-half the length of the shell, and contracted at the lower part. (*Lea.*)

Limnæa rustica; LEA.[1]—Shell subfusiform, thin, imperforate; spire rather elevated; sutures impressed; whirls five, rather convex; aperture narrow elliptical. Fig. 106.

Hab. Poland, Ohio: Dr. Kirtland. My cabinet, and cabinet of Dr. Kirtland. Diam. .15, length .35 of an inch.

Limnæa rustica.

A single specimen only of this was received with some other

[1] H. & A. Adams (II, 253) catalogue a *Limnæa rustica*, Andrz, but whether it has priority of publication or not, I do not know.

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species. It is a small and rather slender species, with a regular tapering spire and an aperture about half the length of the shell. The whole shell is covered over with a red coating of the oxide of iron, giving it a rough aspect. (*Lea.*)

Limnæa griffithiana, LEA.—Shell ovately conical, thin, substriate, shining, somewhat diaphanous, yellowish horn-color, perforate; spire rather short; sutures impressed; whirls five, convex; aperture elliptical.

Fig. 107.

Limnæa griffithiana.

Hab. Charlotte Lake, Columbia County, New York: Dr. Griffith. My cabinet, and cabinets of Dr. Griffith and Philadelphia Museum. Diam. .20, length .30 of an inch.

Rather a small species, differing from most in the form of the mouth, which is nearly a perfect ellipse. In a perfect specimen before me, the aperture within the margin of the lip is thickened by a raised line. The aperture is not quite one-half the length of the shell. I name it after R. E. Griffith, M. D., who seems to be the only person who has observed it. (*Lea.*)

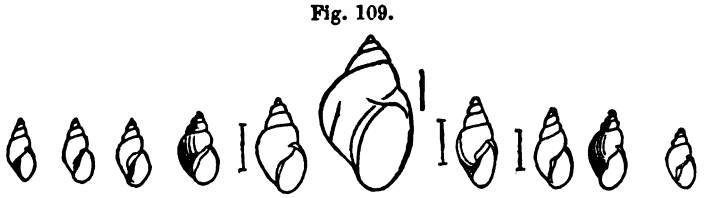
Limnæa linsleyi, DEKAY.—Shell ovate, subventricose; whirls five, rounded, and rapidly attenuated to the apex; suture deep; aperture oblong-oval, longer than the spire. Pillar-lip with a broad calcareous deposit, the lower portion reverted, and partially covering the umbilicus. Lip thin, forming a shoulder at its junction with the preceding whirl. Body-whirl towards the margin of the outer lip, flattened as in *megasoma*, and impressed with deep incremental striæ which are evident from within. Color: Epidermis chestnut, often obscured by a blackish subvillous pigment. Length, 0.25; aperture, 0.15.

Fig. 108.

Limnæa linsleyi.

This shell has affinities of form with *catascopium*, and more especially with the variety which is designated by Say as *L. pinguis*. That variety is, however, represented as having a moderate suture, and the whirls nearly four. I have ventured to impose upon it a new name, expressive of my obligations to the Rev. Mr. Linsley, of Stratford, who furnished me with the specimens from his neighborhood. (*DeKay.*)

Fig. 109.



Forms of *L. humilis.*

Fig. 109 gives, at one view, the various forms which I have referred to *L. humilis.*

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8258	15	Northern Georgia.	A. Gerhardt.	.....
8259	23	Big Sioux.	Dr. F. V. Hayden?	..... [Gerh.
8260	8	Northern Georgia.	A Gerhardt.	"*L. sylvestris*," A.
8261	7	Otsego County, N. Y.	Dr. J. Lewis.	.....
8262	11	.....	.....	.....
8263	12	Yellowstone River?	.....	.....
8264	19	N. Georgia.	A. Gerhardt.	.....
8265	64	Yellowstone River.	.....	.....
8266	6	Milwaukee, Wis.	I. A. Lapham.	..... [Gerh.
8267	14	N. Georgia.	A. Gerhardt.	"*L. riparius*," A.
8268	20	.....	W. G. Binney.	.....
8486	4	Georgia.	A. Gerhardt.	..... [I. Lea.
8523	1	Yellowstone River.	Dr. F. V. Hayden.	Named "*curta*" by

Limnæa ferruginea, HALDEMAN.—Shell ovate-conic, thin in texture and diaphanous, with four convex whirls, distinct suture, and well-marked columellar fold; aperture oval, about as long as the spire; labium appressed, ferruginous.

Fig. 110.

Limnæa ferruginea.

Oregon: Mr. Nuttall.

Closely allied to *L. humilis*, but may be distinguished by the want of an umbilic, and the well-defined fold on the columella. (*Haldeman.*)

Limnæa ferruginea, HALDEMAN, Mon. pt. III, p. 3 of cover (1841), 49, pl. xiii, f. 19, 20 (1842).—DEKAY, N. Y. Moll. 75 (1843).

The above description and figure are copied from Haldeman.

SUBGENUS **LEPTOLIMNEA,** SWAINSON.

Shell nearly cylindrical; spire thick, lengthened; aperture small.

H. & A. Adams use *Omphiscola*, Rafinesque, as the name of this section. I protest against the use of the name in any other sense than proposed by Rafinesque (see spurious species of *Limnæa*). Beck's section *Omphiscola* corresponds with *Leptolimnea*, and he would be quoted as authority for it had he used a new name.

Limnæa kirtlandiana, LEA.—Shell turreted, thin, irregularly striate, pale horn-color, imperforate; spire attenuate; sutures impressed; whirls six, slightly convex; aperture narrow-elliptical.

Fig. 111.

Limnæa kirtlandiana.

Habitat. Poland, Ohio: Dr. Kirtland. My cabinet, and cabinets of Dr. Kirtland and T. G. Lea. Diam. .26, length .70 of an inch.

Many years since, Dr. Kirtland sent me several specimens of this shell. I am not aware of its having yet been de-

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scribed. It may have been mistaken for *L. acuta*, being about the size and having the aspect of that shell. It may be distinguished from it by having a longer and narrower body whirl, and a shorter and narrower aperture. The fold on the columella is smaller and the outer lip less curved. It is a smaller species than the *reflexa*, Say, has one whirl less, and the mouth is longer. In other characters it resembles it, if the reflected lip be excepted. The aperture is rather less than half the length of the shell. Most of the specimens have an obscure brown line within the margin of the outer lip. The body whirl is disposed to be flattened, and is irregularly wrinkled. Under the lens, the fine striæ which usually are found in the *Limnææ*, may be observed beautifully displayed over the whole shell. The superior portion of all the specimens sent, have more or less deposit of the oxide of iron, which gives them the appearance of having two colors. (*Lea.*)

Limnæa kirtlandiana, LEA, Proc. Am. Phil. Soc. II, 33 (1841); Trans. IX, 12; Obs. IV, 12 (1844).

No. 8527 of the collection, so labelled by Mr. Lea, are from Apple Creek, lat. 47°.

Mr. Lea's description and a figure drawn from his type are given above.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8527	1	Apple Creek, lat. 47°.	Dr. F. V. Hayden.	Cab. series. Named by I. Lea.

Limnæa lanceata, GOULD.—Shell moderate, thin, diaphanous, horn-colored, attenuated, delicately reticulated with incremental and revolving striæ; whirls six, flattened, quite oblique, the last equalling three-fourths of the shell's length; aperture narrow, almost equalling one-half the shell's length, acute posteriorly; columella fold conspicuous, acute, scarcely spiral; labrum with a submarginal chestnut band. Length ½, breadth ¼ inch.

Fig. 112.

Limnæa lanceata.

North shore of Lake Superior, "Pic Lake," where it was collected by Prof. Agassiz.

Next to *L. gracilis* this is the most delicate species we have. It may be compared with *L. attenuata* and *L. reflexa*, from both of which it differs in the flatness of its whirls, in its aperture, which is proportionally much longer and narrower, and in being only about half their size. It is much like large specimens of *Physa hypnorum* reversed. (*Gould.*)

Limnæa lanceata, GOULD, Proc. Boston Soc. Nat. Hist. III, 64 (1848); in AGASSIZ' Lake Superior, 244, pl. vii, f. 8–9; Otia, 206.

In addition to Gould's original description, I am able to add

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Fig. 112, drawn from his type, which he sent me for this purpose. No. 9126 of the collection was presented by Prof. Agassiz, from among the original lot collected by him.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9126	1	Lake Superior.	Prof. Agassiz.	Type.

SUBGENUS **ACELLA**, HALD.

Shell very slender, spire attenuated, whirls flattened, oblique; aperture produced, expanded, without fold.

Limnæa gracilis, JAY.—Shell very slender, with from four to six flat and very obliquely revolving whirls; suture distinct; lines of accretion fine; labium unattached, without fold; aperture ovate, spread out, and rounded at both ends. Color nearly white.

Fig. 113.

Limnæa gracilis.

This is the most slender species of *Limnæa* known, and was discovered by Prof. Emmons in Lake Champlain.

Prof. Adams mentions a specimen in his cabinet one inch in length, and in the convexity of the penult whirl only .15 inch diameter. The last whirl is scarcely broader, except across the lips, both of which are expanded. Although nearly seven times longer than the average breadth, it has only four and a half whirls. (*Haldeman.*)

Limnæa gracilis, JAY, Cat. 3d ed. 112, pl. i, f. 10, 11 (1839).—ADAMS, Shells of Vermont, Thom. Vt. 153, pamphlet, 3 (1842).—DEKAY, N. Y. Moll. 70, pl. iv, f. 73 (1843).—HALDEMAN, Mon. 50, pl. xiii, f. 21 (1842).

Acella gracilis, CHENU, Man. de Conch. II, 480, f. 3545.

The species has also been quoted from Wisconsin, Ohio, and Michigan. Fig. 113 was photographed from nature on to the wood. The following are Jay's description and figure:—

Fig. 114.

Limnæa gracilis.

Essex County, N. Y. I am indebted to Prof. Benedict, of Burlington, Vt., for two specimens of this very slender and fragile *Limnæa*. (*Jay.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8524	10	Schuyler's Lake, N. Y.	Dr. J. Lewis.	Cabinet series.
9127	1	New York.	"	.....
9068	20+	Otsego County, N. Y.	"	.....

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Spurious Species of Limnæa.

Limnæa decisa, Say, Nich. Ency. ed. 1 and 2, pl. ii, f. 6 = *Melantho decisa.*
Limnæa heterostropha, Say, Nich. Ency. pl. i, f. 6 = *Physa heterostropha.*
Limnæa subcarinata, Say, Nich. Ency. pl. i, f. 7 = *Lioplax subcarinata.*
Limnæa virginica, Say, Nich. Ency. pl. ii, f. 4 = *Melania virginica.*
Limnæa vivipara, Say, Nich. Ency. pl. i, f. 5 = *Vivipara contectoides.*

I find *Limnæa nigrescens, gracilis*, and *reticulata* mentioned as new species by DeKay in N. Y. Zoological Report of Dec. 20, 1839, p. 32. I know of no other mention or any description of the species.

Limnæa heterostropha is mentioned by name only in Adams' List of Fresh Pond Shells. *Physa heterostropha* being also mentioned, I do not know to what species he may refer. (Silliman's Journ. [1], XXXVI, 392.)

Limnæa ovata, Lam. is mentioned in the Catalogue of Shells of Massachusetts, 1838, p. 37. I do not know what species is referred to under this name.

Woodward (Man. 399) quotes *Limnæa truncatula* from the Canadian region, referring it doubtfully to *L. decollata.* (See remarks under *L. desidiosa.*)

Among the writings of C. S. Rafinesque occur some descriptions of *Limnæidæ* which I repeat here. I translate them from the Podrome de 70 nouveaux genres d'animaux, &c., in the Journal de Physique, de Chemie, et d'Histoire Naturelle, LXXXVIII, June, 1819. However little claim to accuracy the writings on American conchology of this author may possess, it seems to me we are bound to acknowledge and examine carefully all his published descriptions, rather than entirely ignore their existence, as some would do.

Omphiscola, l. c. p. 423.—Differs from *Lymnula* (*Lymnea*, Auct.) by its inferior lip being detached from the columella and divided from it by a long umbilicus. Family of *Limnidæ*. Many lacustrine and fluviatile species.

Espiphylla, l. c.—Differing from *Lymnula* (*Lymnea*, Auct.) by its rounded aperture and its claviform tentacles carrying the eyes at their end. Family *Lymnidæ*. Only one lacustrine species, *E. nympheola.*

Cyclemis, l. c. p. 424.—Differs from *Lymnula* by its rounded shell of two or three slightly oblique whirls. Aperture large, almost round. Animal like that of *Espiphylla*? Two lacustrine species, *C. minutissima* and *C. olivacea.*

Lomastoma, l. c.—Shell acute, pyramidal. Aperture oblong, base obtuse, summit sharp, entirely surrounded by a detached, marginal, acute lip, which is decurrent and inflected at the junction of the summit; no operculum or umbilicus. Animal unknown. Singular genus of the family *Lymnidæ*? One only known species, *L. terebrina.* Shell subulate, smooth,

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four whirls, pale red; aperture one-third the shell's length, breadth one-third of its length. Very rare. In brooks.

Limnæa lubricoides, LEA, of Nebraska Territory, is catalogued without description by Mr. LEA in Warren's Report on Nebraska. (Ex. Doc. H. of Rep. 2d Sess. 35th Cong. 1858–9, Vol. II, part 3, p. 724.) No description of any such species has been published.

Limnæa corrugata is quoted, without description, from Georgia, by SOWERBY in Tankerville Coll. p. 42 (1825), *Helix corrugata*, BUDGIN MS. being given as synonym.

Limnæa petitii, BECK, Newfoundland. No description. Index, p. 113.

Omphiscola pugio, BECK (Index) is mentioned from Mexico, without description.

Limnæa rugosa, VALENCIENNES, appears an immature specimen of some *Bulimulus*. I give below a copy of the original description, and an outline of the original figure. According to FERUSSAC (Bull. Zool. 1835, p. 33), it is his *Cochlogena dombeiana*. See also PFIEFFER, Symb. III, 83.

Limnæa rugosa, VALENCIENNES.—Shell ovate-conic, thin, white, with an obsolete yellowish band; whirls with very numerous furrow-like wrinkles.

This species has six whirls, of which the last is twice as long as the others; ventricose; surface wrinkled by numerous longitudinal ridges, which are not exactly parallel to the edge of the right lip; they are still apparent on the fifth whirl, but on the fourth are mere fine striæ, while the three first whirls have neither striæ or folds.

Aperture an elongated ellipse, slightly narrowed towards the base, its transverse diameter being but one-half the longitudinal; right lip thin and sharp. Within the traces of the external ridges of the last whirl are visible.

Fig. 115.

Limnæa rugosa.

Columella thin, edge rounded, thrown back on the last whirl so as to form a very small umbilicus. Color white, with transverse reddish band, parallel to the suture, on the middle of the last whirl. Length 14 lines.

Hab. Mexico (Bonpland). (*Valenciennes.*)

Limnæa rugosa, VALENCIENNES, in Humb. & Bonp. Rec. d'Obs. II, 250, pl. lvi, f. 5 (1833).—HALDEMAN, Mon. 15, pl. iii, f. 4, 5 (1841).—DEKAY, N. Y. Moll. 75 (1843).

Limnæus rugosus, KÜSTER, in CH. ed. 2, 38, pl. viii, f. 3, 4.

Limnæa conoidea, SAY, and *L. lineata*, SAY, are mentioned by name by H. & A. ADAMS, Gen. Rec. Moll. II, 253. I know of no descriptions of such species by that author.

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Limnæa plicata, LEA, mentioned by name only in the Canadian Geological Report for 1858, by Mr. D'URBAN, is, I suppose, *L. plica*, Lea.

Limnæa fossaria is quoted without description from Canada, &c., by J. DE C. SOWERBY in Richardson's Fauna Boreali-Americana, III, 316 (1836).

Limnæa merostoma, RAV. Cat. p. 11, err. typ. for *macrostoma*.

Limnæa platystoma, HALDEMAN.—Shell thin, transparent, and globose; composed of four whirls, the last of which constitutes nearly the entire shell; aperture ⅔ the entire length, very wide posteriorly; labium and labrum nearly parallel. Length ½ inch.

Fig. 116.

Limnæa platystoma.

Hab. Vermont. (*Haldeman.*)

Limnæa platystoma, HALDEMAN, Suppl. to Mon. pt. I, p. 2 (1840).

The above is Haldeman's description, and Fig. 116 is from his type. No. 9131 was presented by him. Thus we have all the information extant regarding the species. As Prof. Haldeman's original label refers the shells to Maine or Marseilles, it must be considered a doubtful inhabitant of America.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9131	1	Maine or Marseilles.	Haldeman.	Fig. 116. Type.

Limnæa alternata, SAY, mentioned by name only by BELL (Can. Geol. Rep. for 1858) is unknown to me, as is also *L. opacina*, BELL.

FOSSIL SPECIES OF LIMNÆA.

I am indebted to the kindness of Dr. Meek for the following list of fossil species:—

Limnæa vetusta, MEEK, Proc. Acad. Nat. Sc. 1860, 314.
Limnæa similis, MEEK, Proc. Acad. Nat. Sc. 1860, 314.
Limnæa diaphana, EVANS & SHUMARD, Proc. Acad. Nat. Sc. VIII, 1860, 165.
Limnæa nebrascensis, EVANS & SH. Proc. Acad. Nat. Sc. VIII, 1860, 165.
Limnæa tenuicostatus, MEEK & HAYDEN, Proc. Acad. Nat. Sc. 1860, 117.
Limnæa meekiana, EVANS & SHUMARD, MSS.
Limnæa? multistriata, MEEK & HAYDEN, Proc. Acad. Nat. Sc. 1860, 431.

Limnæa (*Limnophysa*) *galbana*, SAY.—Shell subovate; whirls nearly five, very convex; suture very deeply impressed; apex acute; body whirl a little flattened in the middle; aperture not dilated; columella with the sinus of the fold very obvious. Length three-tenths of an inch; aperture rather more than half the whole length.

Fig. 117.

Limnæa galbana.

For this shell I am indebted to Mr. Nuttall, who obtained it in a marl pit near Franklin, New Jersey. He

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considers it fossil, as well as numerous specimens of *Planorbis campanulatus*, *Valvata tricarinata*, and *Physa heterostropha*, found with it. I have never seen a recent specimen, but the present corresponds with some individuals belonging to the Philadelphia Museum, also said to be fossil. (*Say.*)

Limnæus galbanus, SAY, Jour. Acad. Nat. Sc. Phila. V, 123 (1825): BINNEY's ed. 114.

Limnæa galbana, HALDEMAN, Mon. 51, pl. xiii, f. 22, 23.

Mr. Say's type, still preserved in the Philadelphia Academy is drawn in Fig. 117. I have heard of no other locality than that given by Say.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9340	10	New York.	Dr. Lewis.	.....

——?

——? **berendti,** PFEIFFER. Fig. 118 is drawn from a curious shell lately received by the Smithsonian Institution from Mirador, sixty miles west from Vera Cruz, under the name of *Physella berendti*, Pfr. It belongs to a new genus, but *Physella* is preoccupied by Haldeman.

Fig. 118.

——?
berendti.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9357	2	Mirador, Mex.	Dr. Berendt.	One Fig.

POMPHOLYX, LEA.

Tentacles short, stout, rounded. Mantle[1]—? Foot short, bluntly rounded posteriorly.

Shell dextral, depressed-globose, translucent, horn-colored; spire short, obtuse, last whirl very wide, ventricose; aperture very large, wide, subcircular, expanded; inner lip thickened, outer lip acute.

Jaw —?

Lingual membrane —?

[1] I have seen only specimens in alcohol. From these it appears that the only known species cannot be a *Limnæa*, as its tentacles are not flattened and triangular. The eyes are at the place usual in *Limnæidæ*.

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Fig. 119.

Pompholyx effusa, LEA.—Shell small, striate, roundly gibbous, rather thin, effuse, reddish horn-colored; whirls five, flattened above, convex below; aperture subrotund, dilated, within white, spotted.

Sacramento River: Dr. Trask. (*Lea.*)

Pompholyx effusa, enlarged.

Pompholyx effusa, LEA, Proc. Phila. Acad. VIII, 80 (1856); Jour. de Conch. 2d series, II, 208 (trans.), 1857.—H. & A. ADAMS, Gen. Rec. Moll. pl. cxxxviii, f. 11.

Fig. 119 is drawn from Mr. Lea's type.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9242	5	Pitt River.	Dr. Newberry.	Type.

CARINIFEX.

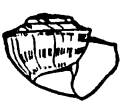
Tentacles —? Mantle —? Foot —?

Shell dextral, spiral, inflated, angular, horn-colored; spire terraced, whirls numerous, angular, visible above, last whirl very large, broad above, very rapidly attenuated below; umbilicus funnel-shaped; aperture triangular, broad above, narrow below; inner lip slightly thickened; outer lip thin, acute, angular above, flexuose.

Jaw —? Lingual membrane —?

The general appearance of the shells for which the generic name of *Carinifex* is proposed would place them among the *Limnæidæ*. Nothing is known of the generic characteristics. The base of the shell resembles somewhat *Taphius*, but that subgenus has the upper surface of *Planorbis*, flattened, spire sunken, whirls rounded.

Fig. 120.



Carinifex newberryi.

Carinifex newberryi, LEA.—Shell light horn-colored, depressed, turreted, very minutely striated, above and below acutely carinated, broadly and deeply umbilicated, whirls five, flat; aperture large, light horn-colored, subtriangular.

Klamath Lake and Canoe Creek, California: Dr. J. S. Newberry. (*Lea.*)

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Planorbis newberryi, LEA, Proc. Phila. Acad. Nat. Sc. 1858, 41.

Fig. 121.

C. newberryi.

Fig. 120 is drawn from the original specimen in Mr. Lea's cabinet. A more elevated form is figured also.

It has also been found in Clear Lake, California.

Another form of this species is figured in Fig. 122. It is less carinated, much more rounded in the whirls, but apparently identical with *C. newberryi*. It is from Pitt River, California.

Fig. 122.

C. newberryi.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8726	..	Clear Lake, Cal.	Dr. Veatch.	Named by Lea.
8727	..	"	"	Cab. ser. Named by
9254	21	Klamath Lake.	Dr. Newberry.	Type. [Lea.
9256	15	Canoe Creek, Cal.	"	.....
9341	6	Pitt River, Cal.	Dr. Cooper.	Type.
9342	1	"	"	" Figured.

PHYSA, DRAPARNAUD.

Tentacles slender, setaceous. Mantle covering part of the shell, the margin fringed or digitate. Foot long, acuminate behind.

Fig. 123.

Physa heterostropha.

Shell sinistral, oblong, thin and polished; spire acute; aperture oval, rounded anteriorly, not dilated; inner lip spread over the last whirl, simple in front; outer lip acute.

Fig. 124.

Jaw of *Physa*.

Jaw single, superior, chevron-shaped.

Lingual membrane —?

This genus is widely distributed over the globe, and is numerous in species in this country, where it extends more southerly than *Limnæa*. In its habits it is more active than the other *Limnæidæ*, both in walking and in gliding, shell downwards, on the surface of the water.

It will be seen in the generic descriptions of *Physa* and *Bulinus* that the former name is restricted to those species having a digitated mantle, and the latter applied only to those whose

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mantle is simple. As Adanson founded his genus on a species having a simple mantle, his name is retained for the last section, leaving Draparnaud's[1] later name for the first section. Thus any confusion of synonymy is avoided.

Physa lordi, BAIRD.—Shell thin, quite large, corneous, tumid, gibbous, aperture large; outer lip acute, marked with an external white or brownish line; external surface very minutely decussated; whirls six, the first two minute, tinged with black, the last swollen, four times the size of the others. Length from ¾ to 1 inch, breadth from ½ to ¾.

Fig. 125.

Physa lordi.

Fig. 126.

Physa lordi.

Lake Osoyoos, British Columbia. (*Brit. Mus.*)

This species is one of the largest of the genus, and is much swollen and gibbous. The outer lip is generally marked with a streak of brown edged with white, which mark is left in those specimens which are of older growth, leaving a white callous-looking line of growth edged with brown, nearly in the centre of the last whirl, which is very large—being about four times the size of all the others put together. The two upper whirls, which are very small, are of a black color. The surface of the shell is finely decussately striated.

The *Physa heterostropha* of Say abounds in the Sumas Prairie, on the Fraser River; but its place seems to be taken on the higher ground towards the Rocky Mountains by the *Ph. lordi* (*Baird.*)

Physa lordi, BAIRD, Proc. Zool. Soc. London, 1863, p. 68.

Fig. 127.

Physa lordi.

I have given above the original description of this species and Figs. 125 and 126, copied from advance proofs of the plates illustrating the British Boundary Commission Report. Fig. 127 is drawn from a specimen collected by the American Commission of the same Survey.

This is the largest North American species of *Physa* yet described.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9310	2	E. of Ft. Colville, W. T.	N. W. Boundary Surv.	Fig. 127.

[1] Draparnaud did not make this distinction in the genus, but his first species has a fringed mantle.

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Physa gabbi, TRYON.—Shell large, thin, closely striated with the lines of growth; body-whirl inflated, its upper half flattened, so that the labrum appears angulated in the middle; spire moderate, apex acute, whirls six, convex, with distinct sutures. Color light corneous, very much polished within; lip margined with red. Length 25, diam. 13; of aperture 15, breadth 3 mill.

Fig. 128.

Physa gabbi.

Fig. 129.

Physa gabbi.

Mountain Lake, Cal.: Rev. T. Rowell. Santa Ana River, Los Angelos County, Cal.: Wm. Gabb. My cabinet, and cabinets of Mr. Rowell and Mr. Gabb.

Several specimens of this fine large species were communicated to me by my friend Mr. Wm. Gabb, after whom I take great pleasure in naming it. It is a much larger, thinner species than *Ph. heterostropha*, Say, and is at once distinguished by the peculiar flattening of the superior portion of the body whirl. The same character will also distinguish it from *Ph. bullata*, Gld., in which species the aperture, moreover, is proportionally longer. (*Tryon.*)

Physa gabbi, TRYON, Proc. Phila. Acad. Nat. Sc. 1863, 149, pl. i. f. 14.

This is a very well-marked species. Fig. 128 is copied from the original figure of Mr. Tryon, whose description is given above. Another figure also is given.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9336	4	California.	G. W. Tryon.	.....

Physa gyrina, SAY.—Shell heterostrophe, oblong; whirls five or six, gradually acuminating to an acute apex; suture slightly impressed; aperture more than one-half, but less than two-thirds the length of the shell; labrum a little thickened on the inner margin. Length rather less than one inch.

Fig. 130.

Physa gyrina.

Inhabits waters of the Missouri.

Of this species I found two specimens at Bowyer Creek, near Council Bluff. It differs from *P. heterostropha* in magnitude, in having a more elongated spire, and less deeply impressed suture. (*Say.*)

Physa gyrina, SAY, J. A. N. S. II, 171 (1821).—BINNEY's ed. 67.—HALDEMAN, Mon. 32, pl. iii, f. 1–6 (1843).—? DEKAY, N. Y. Moll. 79, pl. v, f. 87 (1843).—CHEMNITZ, ed. 2, 20, pl. v, f. 7–10.—ADAMS, Shells of Vermont, 154 (1842).

Physa elliptica, LEA, Tr. Am. Phil. Soc. V, 115, pl. xix, 83 (1837); Obs.

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I, 227.—DeKay, N. Y. Moll. 77, excl. syn. *cylindrica*, err. typ. (1843). —Chemnitz, ed. 2, 22, pl. iii, f. 20–22.

Physa hildrethiana, Lea, Pr. Am. Phil. Soc. II, 32 (1841); Trans. IX, 7 (1844); Obs. IV, 7.

It is mentioned in catalogues, &c., as inhabiting a wide area, the extreme points being Vermont, San Francisco, Michigan, Georgia, Louisiana and Utah.

Mr. Say's type of *Physa gyrina* is still preserved in the Academy at Philadelphia. It is drawn in Fig. 130.

No. 8108 of the collection was labelled *Ph. elliptica*, by Mr. Lea. It does not appear to me distinct from this species, in the synonymy of which it is also placed by Haldeman. A copy of Lea's original description and figure here follow. The name has also been used by Parreyss.

Physa elliptica, Lea.—Shell sinister elliptical, very thin, pellucid, chestnut colored, shining; spire rather short; whirls four; outer lip margined; aperture narrow. Diam. .2, length .5 inch.

Fig. 131.

Physa elliptica.

Hab. ———: T. G. Lea. My cabinet.

This species is less inflated and more of a chestnut color than any I am acquainted with. Its color is almost reddish, and the light-colored margin of the outer lip is remarkable. The aperture is rather contracted, and the whole shell somewhat elongate. (*Lea.*)

Physa hildrethiana, Lea, also appears to me a synonym of *Physa gyrina*. Mr. Lea's description and a figure of his original specimen here follow.

Physa hildrethiana, Lea.—Shell elliptical, somewhat compressed, long, somewhat pellucid; spire obtusely elevated; whirls five; lip margined; aperture long, compressed.

Fig. 132.

Physa hildrethiana.

Hab. A lake in Illinois: Dr. Hildreth. Diam. .40, length .75 of an inch.

This species is among the largest, and is perhaps the most remarkable *Physa* yet observed in this country. The aperture is little more than half the length of the shell. The apex is very obtuse, and the whole shell is somewhat cylindrical. A single specimen was brought by Mr. Nicklin from Dr. Hildreth, and I name it after him, as he seems first to have observed it. (*Lea.*)

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8073	12	South Carolina.	W. Stimpson.	.....
8074	33	Grindstone Creek.	.....	.....
8075	36	Utah Territory.	.....	.....
8076	11	.....	.....	.....
8077	33	Farwell's Mills, Madi-	S. F. Baird.	.....
8078	50	St. Louis. [son, Wis.	.....	.....
8079	8	Ann Arbor, Mich.	W. G. Binney.	.....
8080	12	St. Clair River.	.....	.....
8081	3	Michigan.	.....	.....
8082	3	Racine, Wis.	S. F. Baird.	.....
8084	2	Milwaukee, Wis.	I. A. Lapham.	.....
8085	5	Utah.	Capt. J. H. Simpson.	.....
8086	10	.....	.....	Cabinet series.
8520	2	.....	W. G. Binney.	.....
8729	1	San Francisco.	Rowell.	Cab. ser. W. Coast.
9094	50	Grand Rapids, Mich.	Dr. Lewis.	*P. hildrethiana*, teste
9167	1	Michigan.	W. G. Binney.	..... [Lewis.
8108	64	Grand Rapids, Mich.	Dr. J. Lewis.	*P. elliptica*, Lea.
8109	1	Indiana.	W. G. Binney.	Named by I. Lea.
8516	7	Michigan.	Dr. J. Lewis.	Named by Dr. R. E.
9209	14	Uniontown, Ala.	Dr. Showalter.	Cab. ser. [Griffith.

Physa ampullacea, GOULD.—Shell large, ovate-ventricose, thin, fragile, shining, horn-colored; spire elevated, acute; whirls six, last one inflated; suture decidedly impressed; aperture broadly ovate, five-sixths the length of the shell; labrum thin, submargined with red; columella quite flexuous, covered with callus. Length 1, breadth $\frac{1}{2}\frac{8}{8}$ to $\frac{1}{2}\frac{9}{0}$ inch.

Fig. 133.

Physa ampullacea.

Found in Oregon by Dr. J. G. Cooper.

Distinguished by its large size, inflated form, and delicate structure; sometimes the form is somewhat cylindrical. It accords most nearly with Haldeman's plate iii, f. 9, which was given him as *P. sayii*, Tappan. It is much more delicate, and less polished than *P. heterostropha*, Say, and the aperture is less elongated. (*Gould.*)

Fig. 134.

Physa ampullacea.

Fig. 135.

Physa ampullacea.

Physa bullata, GOULD, Proc. Bost. Soc. Nat. Hist. V, 128 (1855); Otia, 216 (not of POT. et MICH.).

Physa ampullacea, GOULD in litt.

Found also in Lake Oyosa, Washington Territory, by Dr. Cooper, one of whose specimens is figured above. (Fig. 133.)

The name proposed by Dr. Gould for this species being preoccupied by Potiez and Michaud, I, 223, 1838, he suggests that adopted above.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8574	4	.....	.....	.....
8722	5	.....	.....	.....
9170	2	Oregon.	Dr. J. G. Cooper.	Original ex'm named
9264	2	Rhett Lake, Cal.	Dr. Newberry.	..... [by Gould.
9267	11	Upper Klamath Lake.	"	.....

Physa sayii, TAPPAN.—Shell sinistral, ovate, color brownish-yellow or chestnut; whirls five; the first large, the others small, terminating in an acute, dark brown apex; aperture large, four-fifths of the length of the shell; translucent. Length 1, breadth $\frac{7}{10}$ inch.

Fig. 136.

Physa sayi.

I first found this shell, May, 1837, in a small lake called Lake Pipin, which is separated about fifty rods from the Cuyahoga River, in Franklin Township, Portage County, Ohio, the same locality where was found the *Anodonta pepiniana*, Lea. All the shells of this species hitherto found were dead, although much time was spent in examining for live ones, in May, 1837, and June, 1838. A few only were found, and are in the cabinets of Mrs. Say, Dr. Kirtland, Dr. Ward and myself. (*Tappan.*)

Physa sayii, TAPPAN, Amer. Journ. Sc. [1], XXXV, 369, pl. iii, f. 3 (1839).

I am unacquainted with this species. Judging from the description and figure, which I have copied above, I should not agree with Haldeman in placing it in the synonymy of *P. ancillaria.*

Physa vinosa, GOULD.—Shell thin, ovate-globose, red, with minute spiral striæ and thin epidermis; spire obtuse; whirls four, the last very large; aperture ovate-lunate, three-fourths the shell's length, liver brown within; columella straight and thin. Length $\frac{3}{4}$, lat. $\frac{1}{2}$ inch.

Fig. 137.

Physa vinosa.

Brought by Dr. C. T. Jackson from the Lake Superior region.

A remarkably inflated species, most like *P. ancillaria*, Say, but is not shouldered or widest behind the middle, nor tapering anteriorly. It is well distinguished by its thin structure, striated surface, wine-red color externally, and liver-brown internally. (*Gould.*)

Physa vinosa, GOULD, Proc. Bost. Soc N. H. II, 263, fig. (1847); in Agassiz' Lake Sup. 244, pl. vii, f. 10–11 (1850); Otia, 201.

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No. 9096 of the collection was presented by Prof. Agassiz from the original lot collected by him. Gould's description and figure are copied above.

It has also been catalogued from Michigan.

The lingual teeth of the lateral rows of *Physa vinosa* are represented in Fig. 138.

Fig. 138.

Lingual dentition of *Physa vinosa*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9096	1	Lake Superior.	L. Agassiz	Original lot. Type.
9160	2	Owasco Lake, N. Y.	Mrs. H. W. Parker.	(Really *P. vinosa*?)

Physa ancillaria, Say.—Shell heterostrophe, sub-globose, pale yellowish; whirls rather more than four, very rapidly attenuated; spire truncated, hardly elevated beyond the general curve of the surface; suture not impressed; aperture but little shorter than the shell, dilated; labrum a little thickened on the inner margin. Length more than one-half of an inch.

Fig. 139.

Physa ancillaria.

The spire of this species is unusually short, truncated at tip like the *Paludina decisa*, nob.; and the suture is so inconspicuous as to give rise to the name which I have chosen for it. My brother, B. Say, obtained it in the Delaware River, near Easton, and Mr. Jessup collected numerous specimens in the Connecticut River, above Hartford. It may be distinguished from *P. heterostropha*, nob., by the shorter and truncated spire, inconspicuous suture, as well as by the more obtusely rounded junction of the labrum with the base, and by the general form. (*Say.*)

Physa ancillaria, Say, Jour. Acad. Nat. Sc. V, 124 (1825); Binney's ed. 114.—Haldeman, Mon. 27, pl. iii, f. 1–10 (1843).—Gould, Invert. 213, f. 142 (1841).—Adams, Shells of Vermont, 154 (1842).—DeKay, N. Y. Moll. 78, pl. v, 90 (1843).—Chemnitz, ed. 2, 20, pl. xii, f. 12–13.—Chenu, Man. de Conch. II, 480, f. 3550.—Anon. Can. Nat. II, 211, fig. (1857).

Physa obesa, DeKay, N. Y. Moll. 78, pl. v, f. 86 (1843).

This species appears to range from New England to Louisiana. It is very numerous in the Delaware River at Burlington, on the muddy shores left bare at low tide. The animal burrows into the mud as soon as left by the water, and remains concealed until its return. On the piers of the wharves it crawls downwards with the fall of the tide and upwards again as it rises, thus keeping always near the surface.

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Physa obesa, DeKay, appears to me identical with this species, judging only from his description and figure here copied.

Physa obesa, DeKay.—Shell ventricose; when young, very thin and fragile. Whirls four to five, rapidly attenuated to a minute and slightly elevated polished apex. Body whirl inflated, with its upper surface near the suture depressed, and forming an obtuse angle with the lower portion; suture semicanaliculate. Surface polished, with minute incremental lines. Aperture elliptical. Color pale horn. Length 0.5, of aperture 0.4 inch.

Fig. 140.

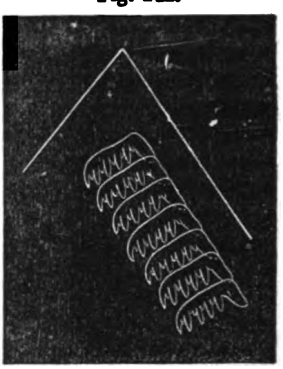
Physa obesa.

This species was communicated to me by Dr. Budd, who obtained it from the Mohawk and Hoosic Rivers, Rensselaer County. I have since received from the same gentleman specimens eight-tenths of an inch long, and quite solid with a stout callus. Some naturalists who have seen it are disposed to consider it as identical with *P. ancillaria*. (*DeKay.*)

Haldeman refers *Physa sayii*, Tappan, to *P. ancillaria*. I have considered it as distinct.

The lateral teeth of the lingual membrane of *Physa ancillaria* are represented in Fig. 141, as well as the line formed by one transverse row of the teeth.

Fig. 141.



Lingual dentition of *P. ancillaria*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8096	9	Loup Fork.	.....	.....
8097	2	Hudson River.	Dr. J. Lewis.	.....
8098	5	Cherry Creek.	.....	.....
8099	2	.....	.....	.....
3523	6	30 m. w. of Ft. Kearney.	.....	.....
8100	2	Ohio. [town.	S. M. Luther.	.....
8101	9	Little R., near Shawnee-	.....	.....
8102	17	Ruby Valley.	Capt. J. H. Simpson.	.....
8103	10	Hudson River, Albany.	Dr. J. Lewis.	.....
8104	8	St. Louis, Mo.	.....	.....
8105	3	Salisbury, Conn.	W. G. Binney.	.....
8106	8	Maine.	Dr. J. Lewis.	Var.
8107	5	Yellowstone River?	Col. A. Vaughan.	.....
8515	3	New York.	Dr. J. Lewis.	Cabinet series.
8517	1	Hiram, Ohio.	.....	"
9203	8	Delaware River.	W. G. Binney.	.....

Physa osculans, Haldeman.—Shell ovate or subglobose, ashy-red, thin; whirls five, suture impressed; aperture wide. Shell allied to *P.*

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heterostropha, and presenting nearly the same varieties; translucent; texture very thin; lines of accretion fine; aperture wide, columella thick, with the fold obsolete, or but slightly impressed. Fig. 142.

Mexico? India?

Physa osculans

Specimens of this shell were presented to the Academy of Natural Sciences by Dr. M. Burrough, and Mexico is given as the native country, but as this enterprising traveller also made collections in India, it is not impossible that they may be from the latter country. In either case, the species appears to occur in too great abundance to allow us to suppose that it is now characterized for the first time. Fig. 13 is from a specimen in Dr. Jay's collection, and may be a distinct species. (*Haldeman.*)

Physa osculans, HALDEMAN, Mon. p. 29, pl. ii, f. 13, excl. f. 11, 12 (= *heterostropha*) (1843).

Subsequent researches have left no doubt of the habitat being Mexico.

The specimens figured on Plate 2, Figs. 11 and 13, of Haldeman's Monograph were subsequently referred to *Physa heterostropha*. I have, therefore, retained the name *osculans* (as he suggests) for the Mexican form with narrower aperture and more pointed spire. My figure is copied from his figure 13. See also remarks under *Physa heterostropha*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8978.	..	San Felipe Springs.	Beale.	.....
9009	..	Mexico.	Acad. Nat. Sc. Phila.	.....
9141	4	City of Mexico.	Lt. Beale.	.....

Physa mexicana, PHILIPPI.—Shell imperforate, ovate, inflated, light horn-color, thin, dull and not shining, very finely wrinkled; the apical whirls occupy one-fourth of whole length; mouth wide; columellar fold broadly expanded, almost in the centre of the aperture. Fig. 143.

Physa mexicana.

Shell ovate, inflated, formed by five whirls, and covered with fine broken microscopic wrinkles, parallel to the lines of growth, which prevents the surface from being shining. Whirls tolerably arched, forming a depressed suture, last whirl globose. Mouth longitudinally ovate, wide, the inner lip tolerably widely folded, the columella below the fold is appressed, prominent and rimmed—in one individual of only 6½‴ the outer lip is furnished with a smoky, reddish thickening. Height 8¾‴, breadth 5¾‴; ap. 7‴ long. 3¼‴ broad.

Hab. Mexico. (*Küster.*)

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Physa mexicana, PHILIPPI in KÜSTER, Chemn. ed. 2, p. 5, pl. i, f. 3–4.

I can give no other information regarding this species than that furnished by the original description copied above. One of Küster's figures also is given. The specimens in the collection no doubt are to be referred to the species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8092	10	City of Mexico.	.....	.....
8093	8	Texas.	Lieut. Couch.	Cabinet series.
8519	2	City of Mexico.	.....	.....

Physa heterostropha, SAY.—Shell sinistral, subovated; color pale yellow, chestnut or blackish; whirls four, the first large, the others very small, terminating rather abruptly in an acute apex; aperture large, somewhat oval, three-fourths of the length of the shell, or rather more; within of a pearly lustre, often blackish; lip a little thickened on the inside, and tinged with dull red.

Fig. 144.

Physa heterostropha, from Say's type.

Inhabits with the first species (*L. catascopium*), and almost as numerous. Pl. 1, Fig. 6.

Fig. 145.

Physa heterostropha, from Say's figure.

Animal resembles that of *Limnæa cattuscopium*, but is of a darker color and longer than its shell, the tentacula also are longer and setaceous; tail acute. The mantle is trifid at the base of the pillar lip, and at the upper corner of the aperture; deposits eggs the beginning of May; eggs enveloped by a transparent gelatinous substance; the nucleus, after a few days, appears of a pale or milk-white color, and not so well defined as those of *L. catascopium*. (*Say.*)

Limnæa heterostropha, SAY, Am. ed. Nich. Enc. pl. i, f. 6 (1817, 1818, 1819): BINNEY's ed. 46, pl. lxix, f. 6.

Physa heterostropha, SAY, Jour. Acad. Nat. Sc. II, 172 (1821): BINNEY's ed. p. 68.—HALDEMAN, Mon. p. 23, pl. ii, f. 1–9 (1843).—GOULD, Invert. p. 211, f. 141 (1841).—ADAMS, Shells of Vt. 154 (1842).—DESHAYES in Lam. An. sans Vert. VIII, 402; ed. 2, III, 412.—DEKAY, N. Y. Moll. p. 76, pl. v, f. 82 (1843).—CHEMNITZ, ed. 2, p. 7, pl. i, f. 7, 8.—MRS. GRAY, Fig. Moll. An. pl. cccx, f, 9.—POTIEZ et MICHAUD, Gal. des Moll. I, 224, pl. xxii, f. 15, 16.—ANONY. Canada Nat. II, 209, fig. (1857).

Physa fontana, HALDEMAN, Mon. pt. 2, p. 3 of cover (1841).

Physa cylindrica, NEWCOMB in DEKAY, N. Y. Moll. 77, pl. v, f. 82 (1843).

Physa aurea, LEA, Trans. Am. Phil. Soc. VI, 18, pl. xxiii, f. 106; Obs. II, 18 (1839).—DEKAY, N. Y. Moll. 80, pl. v, f. 89 (1843).

Physa plicata, DEKAY, N. Y. Moll. p. 78, pl. v, f. 85 (1843).

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Physa osculans, HALDEMAN, Mon. part, f. 11, 12.
Physa striata, MENKE, Syn. Méth. ed. 2, p. 132 (1830), teste Haldeman.
Physa subarata, MENKE, Syn. Méth. ed. 2, p. 132 (1830), teste Haldeman.
Physa charpentieri, KÜSTER in CHEMN. ed. 2, p. 23, pl. iv, f. 4–6.
Physa philippi, KÜSTER in CHEMN. ed. 2, p. 19, pl. iii, f. 3–6.
Physa inflata, LEA, Proc. Am. Phil. Soc. II, 32: Trans. IX, 7; Obs. IV, 7.
Helix heterostrophus, EATON, Zool. Text-Book, 195 (1826).
Bulla crassula, DILLWYN, Conch. tab. 1, 487, No. 36 = *fontinalis*, CHEMNITZ, Conch. IX, 33, pl. ciii, f. 879, 880, var. 3.—GMELIN, Syst. 3407.—SCHROTER, Einl. t. I, 261, *Helix* No. 84.
Cochlea neritoides, LISTER, Conch. pl. cxxxv, f. 34.

Of this species I have seen specimens from Texas and Georgia, and from as far north as Great Slave Lake. It ranges from the Atlantic to the Pacific. It is our most common species.

Mr. Say's types are still in the collection of the Philadelphia Academy. One is drawn in Fig. 144.

Physa fontana, formerly described as distinct, is referred to this species by Haldeman (Mon. p. 26). His description here follows:—

Physa fontana.—Animal dark fuliginous, foot as long as the shell; shell ovate, translucent, composed of three convex turns; apex eroded; suture well marked; labium nearly straight, with a slight fold; color yellowish-brown. Length ¼ inch.

Inhabits cold springs in Pennsylvania.

Closely resembles *P. fontinalis* of Europe, but the foot is shorter. (*Haldeman.*)

Among the shells figured by Haldeman as *Physa osculans* appear some of this species. He says of them:—

Physa osculans.—The United States specimens of this shell will merge into *P. heterostropha*. One specimen, supposed to be from the West, is in reality from Mexico. This appears distinct, and may retain the name until I learn more about it. Although the aperture is narrow, some specimens in the Academy's collection have it very wide.

Fig. 146.

Physa osculans.

My opinion of the identity of *Physa striata* and *Physa subarata*, of Menke, is founded on his description alone, having seen no authentic specimens. His words are:—

Physa striata, MENKE.—Shell ovate, sub-opaque, reddish horn colored; last whirl longitudinally, elegantly and lightly striated; spire short, obtuse; internal margin of the labrum doubled, the exterior obsolete,

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white, the interior within the throat acute, red, showing a band without. Length 6½, breadth 4 lines.

Hab. Goshen, Mass. (*Menke.*)

Physa subarata.—Shell ovate, pellucid, ashy horn-color; last whirl ventricose, somewhat furrowed transversely; spire short, acute; labrum thickened within. Length 5, breadth 3 lines.

Hab. Near Cincinnati in the Ohio River. (*Menke.*)

Not having seen authentic specimens of the following species, my opinion of their identity with *Physa heterostropha* is based on a study of the original descriptions and figures here copied.

Physa cylindrica, NEWCOMB.—Shell remarkably solid, sinistral, cylindrical. Whirls four, rapidly diminishing to the sub-acute apex. Surface moderately smooth, and polished with incremental lines. Suture impressed; outer lip with a sinuous margin, nearly straight, forming an acute angle with the body, effuse beneath; body whirl not convex, but rather flattened and cylindrical. Aperture narrow above, moderately dilated and elongated beneath. Columella smooth, arched with a conspicuous callus reflected over the umbilicus. Light rusty, or opaque rusty white; outer lip with a rusty sub-margin within. Length 0.5, of aperture 0.35.

Fig. 147.

Physa cylindrica.

This specimen was communicated by Dr. Newcomb, who obtained it from Red Creek, Wayne County. I have received the same shell under the name of *P. elliptica*, Lea; but it does not agree with his description. (*DeKay.*)

Physa aurea, LEA.—Shell sinister, rather inflated; golden color, pellucid, shining; spire rather short; whirls four; outer lip margined; aperture somewhat inflated.

Fig. 148.

Physa aurea.

Habitat. Hot Spring, Bath County, Virginia: P. H. Nicklin. My cabinet, and cabinet of P. H. Nicklin. Diam. .3, length .5 inch.

Mr. Nicklin informed me that he found the *Physa aurea* in a little watercourse by which a hot and a cold spring discharge their mingled waters. The former exhibits a temperature of 106° and the latter of about 56° of the scale of Fahrenheit. Near the meeting of the waters, one side of the little stream is cold and the other side hot; and multitudes of these beautiful *Physæ* are to be found on both sides of the line of junction, availing themselves of the power which the locality affords them of changing their climate according to their fancy. (*Lea.*)

Physa plicata, DEKAY.—Shell moderately solid, subovate, elongate, symmetrical. Whirls four to five, rapidly attenuated to the apex. Surface with equidistant, longitudinal, and obsolete inequidistant transverse raised

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lines; suture distinct. Pillar-lip with a broad nacreous deposit. Aperture more than two-thirds of the total length, acutely oval. Amber, but coated with a black pigment; before this is removed, the aperture is bluish iridescent. Length 0.6–0.8, of aperture 0.2–0.3 inch.

Fig. 149.

Physa plicata.

This description is from specimens of the largest size, obtained from a pond on New York Island. It moves like *P. heterostropha*, with great celerity on the surface of the water, with its mouth downward. In some specimens the revolving and longitudinal lines are so distinct, particularly the former, that the surface of the body whirl appears covered with distinct square facets. Some naturalists consider it only a variety of *heterostropha*. It differs in many important particulars from that species, but I regret that I have not been enabled yet to examine the animal. (*DeKay.*)

Physa charpentieri, Küster.—Shell ovate-conic, semi-transparent, smooth, shining, yellowish; whirls five, flattened; aperture oblique; columella subplicate, peristome thickened.

Fig. 150.

Physa charpentieri, enlarged.

Shell small, ovate conical, very transparent, shining, smooth, dark yellow; spire depressed conical, whirls almost flat, scarcely separated by the suture, increasing moderately. The body whirl decreasing in size toward its base, which is like an inverted cone; mouth yellowish, tolerably wide, somewhat oblique; outer lip arched, acute and thickened within by a flesh-colored callus, which is visible on the exterior as a bright yellow band; columella convex, with an elevated fold, which is thin, broad, and sinuose. Height 4½, breadth 2⅔; aper. 3‴ long.

Habitat. Baltimore: received by Mr. Bergrath v. Charpentier. (*Küster.*)

Physa philippi, Küster.—Shell ventricose-ovate, acute, striate, shining, diaphanous, yellowish horn color; spire short, conoid, rather acute; whirls five, rapidly increasing, convex; aperture elongate-ovate; columella concave; white, peristome sharp, with a ruddy band within.

Fig. 151.

Physa philippi, enlarged.

Resembling in its general appearance *Physa heterostropha*, and in its straight axis and edge of the aperture, yet there are differences enough to distinguish it as a distinct species. The shell is ventricose, ovate, thin, and almost transparent, with waving wrinkles and yellowish horn-color. The apical whirls are rather short, comprising almost one-third of the length of the shell, increase rapidly in size, and are flattened convex, with a somewhat deep suture; body whirl ventricose; inner lip arched, rather wide; mouth long, ovate, almost as broad as long; columella concave, white, arcuate, and separated by a sinus from the

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termination of the outer lip, peristome adherent, somewhat arched, acute, with a reddish callus within. Height 7½, breadth 4; aperture 5‴ long.

To the young of this species, or a variety, I refer a shell of which three specimens were sent to me from the Stuttgard Museum, as *Ph. heterostropha*. The shell is almost transparent, rather less ventricose, very shining, but corresponds with the above description in the form of the mouth, the axis, the reddish callus within the lip, and the curved reticulations. Height 5½, breadth 3″. (Fig. 5 is six times the natural size.)

Hab. North America. (*Küster.*)

Physa inflata, Lea, whose description is given below, appears to me a synonym of *Ph. heterostropha*. Fig. 152 is drawn from his type.

Physa inflata, LEA.—Shell inflated, dark, somewhat pellucid; spire somewhat elevated, acutely conical; whirls five; outer lip margined and inflated; aperture wide.

Fig. 152.

Physa inflata.

Hab. Virginia, between the Salt Sulphur and the Sweet Springs: Ph. Nicklin. My cabinet, and cabinet of Mr. Nicklin. Diam. .48, length .65 of an inch.

Two specimens were taken by Mr. Nicklin in a small stream which crosses the road in a gap in the main chain of the Alleghany Mountain between the Salt Sulphur and the Sweet Springs in Virginia. The gap is nearly level for several miles, and some of the streams run to the west and some to the east. This species seems to me to differ from any with which I am acquainted. It is perhaps most nearly allied to *P. heterostropha* (Say), but has a shorter aperture and is more inflated. (*Lea.*)

Dr. Gould tells me that a specimen of *Ph. heterostropha* in the Garden of Plants is labelled *Ph. arctistropha*, Jan. Villa (Disp. p. 32) quotes *Ph. cubensis*, Pfr., as a synonym of *Ph. heterostropha*.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8047	3	Near Red River.	R. Kennicott.	.....
8048	2	Black Hills.	.....	.....
8049	5	Fort Peirce.	.....	.....
8050	31	Big Sioux.	.....	.....
8051	3	Milwaukee, Wis.	I. A. Lapham.	.....
8052	43	Mohawk, N. Y.	Dr. J. Lewis.	Vars.
8053	16	Southern Illinois.	R. Kennicott.	.....
8054	1	Toledo, O.	F. A. Bossard.	.....
8055	57	Ruby Valley. [of the Woods.	Capt. J. H. Simpson, Army in Utah.	.....
8056	4	Lac des Mille Lacs to L.	R. Kennicott.	.....
8057	8	Platte River, N. T.	.....	.....
8058	11	Centre County, Pa.	.....	.....
8059	7	Mohawk, N. Y.	Dr. J. Lewis.	.....
8060	4	Chattanooga, Tenn.	A. Gerhardt.	.....
8061	9	Erie Canal, N. Y.	Dr. J. Lewis.	.....
8062	8	Nolachucky R., E. Tenn.	.....	.....
8063	6	Milwaukee, Wis.	I. A. Lapham.	.....
8064	23	Mohawk, N. Y.	Dr. J. Lewis.	.....
8065	12	Maine.	"	.....
8066	17	Northern Georgia.	A. Gerhardt.	.....
8067	10	Hiram, O.	S. M. Luther.	.....
8068	14	20 miles f. Ft. Kearney.	.....	.....
8069	11	Marietta, O.	W. Holden.	.....
8070	1	.....	.....	Fossil?
8071	10	Westfield, Mass.	Dr. J. Lewis.	.....
8072	5	Owasco Lake, near Au-	"	.....
8083	4	Hiram, O. [burn, N. Y.	S. M. Luther.	.....
8465	2	Southern Utah.	Capt. J. H. Simpson.	.....
8466	80	Chilouc ynck Depot.	A. Campbell.	.....
8513	2	Massachusetts.	I. Lea.	Cabinet series.
8956	1	Northern Georgia.	Dr. Jones.	.....
9090	100+	Mohawk, N. Y.	Dr. Lewis.	.....
9091	20+	Grand Rapids, Mich.	"	.....
9092	20+	Mohawk, N. Y.	"	.....
9099	3	San Francisco.	Judge Cooper.	.....
9101	1	Washington Territory.	"	.....
9104	20+	Mohawk, N. Y.	Dr. Lewis.	.....
8974	..	Lake Utah.	Capt. Burton.	.....
9179	50	Vermont.	Chittenden.	.....
8528	1	Virginia.	W. G. Binney.	*P. aurea*, Lea.
9267	2	Isle la Crosse.	R. Kennicott.	.....
9268	2	Great Slave Lake.	"	.....
9269	1	Peace River.	"	.....
9261	8	Virginia.	Dr. English.	.....
9263	3	Hell Gate River.	Dr. Newberry.	.....

Physa fragilis, MIGHELS.—Shell very thin and fragile, translucent, horn-color, obliquely ovate; whirls four; last whirl campanulate, suture deeply impressed at the enlargement of the last whirl; spire usually less than one, sometimes only one-fourth part of the length of the shell; labrum very thin, advanced; labium tumid with a thin, loosely adherent lamina. Length, .55 inch; greatest breadth, .4 inch; divergence, 90°.

Fig. 153.

Physa fragilis.

Animal of a very obscure, light-green color; whole surface of the body covered with oblong dark spots; foot shorter than the shell, lanceolate; tentacles nearly white, rather long, very slender; mouth blood-red. Its motions are exceedingly rapid; very timid, withdrawing itself on the least alarm. It is very tenacious of life, at least it is not easily *starved*. Three specimens are now before us in a tumbler of water, November 10th, where they have remained since the first of July. The water has not been changed more than half a dozen

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times, yet they are as brisk as when first taken; and moreover they have grown at least one-quarter. Exuviæ white, abundant, vermicular.

Cabinets of Boston Society of Natural History, Amherst and Middlebury Colleges, Mons. Largillier, S. S. Haldeman, J. W. Mighels, and C. B. Adams.

Hab. Monmouth, Maine: discovered in a mill-pond, after the water was drawn off, by Mr. N. T. True, to whom we are indebted for specimens.

This species is distinguished from *P. heterostropha* by the campanulate aperture, which is constant, shorter spire, tumid labium, and by its remarkable tenuity. (*Mighels.*)

Physa fragilis, Mighels, Proc. Bost. S. N. S. I, 49 (1841).—Mighels & Adams, Bost. J. N. H. IV, 44, pl. iv, f. 12 (1842).—Haldeman, Mon. p. 31, pl. iv, f. 11–13 (1843).—DeKay, prelim. Cat. N. Y. Moll. anno 1839, p. 32?

Dr. Foreman catalogues *Ph. fragilis* from the District of Columbia.

I have seen no authentic specimen of this species, which is admitted by Haldeman as distinct. I am inclined to believe it a variety of *Ph. heterostropha.* The original description and figure are copied above.

Physa semiplicata, Küster.—Shell ovate, shining, semi-transparent, horn-colored; whirls five, convex, regularly wrinkled or grooved, the last smooth below; aperture broad; columella concave, sub-plicate; peristome straight, acute.

Fig. 154.

Physa semiplicata.

A species readily recognized by its peculiar sculpturing; the shell is longitudinally-ovate, shining, transparent, horn-colored; the apex is somewhat depressed, obtusely ovate, whirls arched, separated by a depressed, transversely wrinkled suture; body whirl large, ventricose, rapidly decreasing towards the rounded base, with delicate incremental striæ and longitudinally grooved on its upper half; mouth moderately high, and especially towards the base, broad; outer lip thin, straight, acute, curving and obtusely rounding below; columella short, concave, folded; fold broad, rather thin, white. Height 5, breadth 3‴.

Hab. Unknown. I once received a single specimen among some small American sea shells. (*Küster.*)

Physa semiplicata, Küster in Ch. ed. 2, p. 24, pl. iv, f. 7–9.

I can give no information regarding this species further than that contained in the original description and figure copied above.

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Physa costata, NEWCOMB.—Shell ovate globular, horn-colored or reddish corneous; whirls four, the last inflated and roundly angulated above, armed with ten to fourteen prominent longitudinal ribs; apex acute; spire short; aperture ovate.

Mus. Cal. Ac. N. S. My cabinet.

For this curious species of *Physa* we are indebted to Dr. Veatch, who collected several specimens at Clear Lake, California, most of them, however, immature. This is the only species provided with regularly arranged costæ that I have seen, and this character alone will be sufficient to separate it from all other described species of the genus. (*Newcomb.*)

Physa costata, NEWCOMB, Proc. California Ac. Nat. Sc. II, 104.

I have seen no specimen of this species, that sent me by Dr. Newcomb having been lost at sea.

Physa solida, PHILIPPI.—Shell perforate, longitudinally ovate, solid, pale horn-color; whirls arched, apical whirls pointed, comprising one-third the whole length of the shell; mouth narrowed by the thickening of the lip; columella not folded.

Fig. 155.

Physa solida.

This is the heaviest species known to me, and is composed of six moderately arched whirls. The surface is sometimes reticulated, owing to the striæ of growth being crossed by other lines, which are owing partly to delicate lace-like prominences, and partly to a different degree of transparency of the shell. Suture tolerably defined. Mouth longitudinally ovate, columellar fold quite indistinct; the inner lip thick, adherent, forming an umbilicus; columella arcuate. Also the outer lip is thickened just within by a brownish-red callus, which appears white from the outside. Height $7\frac{1}{4}'''$, breadth $4\frac{3}{4}'''$; mouth $4\frac{3}{4}'''$ high, $2\frac{1}{3}'''$ broad.

Hab. New Orleans: My brother.

Physa gyrina, Say, differs in having a thin, transparent shell, a shorter apex, as does also *Physa heterostropha*, Say, which has an obtuse apex; *Ph. acuta*, Dr., which resembles it in form, is smaller, thinner, and has an apex comprising only one-fourth of the whole length of the shell. (*Philippi.*)

Physa solida, PHILIPPI in CHEMN. ed. 2, p. 6, pl. i, f. 5, 6.

Of this species I have no fuller information than that contained in the original description and figure copied above.

The specific name appears to be preoccupied by Potiez and Michaud, Gal. des Moll. I, 227 (1838).

Physa virginea, GOULD.—Shell slender and delicate, thin and shining, of a milk-white or porcelain-white color; spire about one-third the length of the shell, sharply pointed, of five or more moderately convex

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whirls, the last of which has a faintly angular appearance near the suture. Aperture narrow and elongated, two-thirds the length of the shell, acute behind. Columella short, delicate, slightly sinuate, folded. Length $\frac{3}{8}$, diam. $\frac{1}{8}$ inch.

Fig. 156.

Physa virginea.

Sacramento River, California: Budd.

A very well-marked species, of a porcelain-like structure and color, which appears not to be the consequence merely of blanching. It is less slender than *Ph. hypnorum*, and more like *Ph. gyrina*, Say, or *Ph. rivalis*, in form, but is a far more delicate shell, and one of the most elongated species. (*Gould.*)

Physa virginea, GOULD, Proc. Boston S. N. H. II, 215 (1847); U. S. Ex. Ex. Moll. p. 120, f. 138, 138*a* (1852); Otia, 43.

Fig. 156 is drawn from a specimen lent me by Dr. Gould. Specimens have recently been added to the collection of the Smithsonian.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8122	10	San Francisco.	.....	.....
8507	..	.....	.....	.....
8569	3	River Sacramento.	.....	Cabinet series.
8728	3	San Francisco.	Rowell.	.....

Physa humerosa, GOULD.—Shell subrhomboid, solid, smooth and white; spire acute; whirls five, tabulated; aperture equalling one-half to two-thirds the shell's length, rounded posteriorly; labrum expanded; columella scarcely plicate, callus hardly perforated. Length $\frac{1}{2}$ to $\frac{7}{10}$, breadth $\frac{3}{8}$ inch.

Fig. 157.

Physa humerosa.

Found by Dr. Thomas H. Webb and by W. P. Blake, in the Colorado Desert and at Pecos River.

The broadly tabulated whirls, with the acute, elevated spire, and foldless columella clearly distinguish this species. It is like *P. tabulata*, Gould, and the variety figured by Haldeman, as *P. ancillaria* (fig. 7), which he regards as a monstrosity; the deep suture and simple columella distinguish it from that species. (*Gould.*)

Physa humerosa, GOULD, Proc. Bost. Soc. Nat. Hist. V, 128 (1855); Otia, 216; Pac. R. R. Rep. V, 331, pl. xi, f. 1–5; Prelim. Rep. 23 (1855).

It has also been found at San Diego. The shell figured was presented by Dr. Gould to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8113	4	Des. of Colorado R., Cal.	Lt. R. M. Williamson.	Dead shells.
8114	2	Creek leading to Desert,	"	.....
3252	1	San Diego. [Cal.	P. R. R.	Cabinet series.

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Physa pomilia, CONRAD.—Shell with four volutions, horn-colored and polished; spire short conical; body whirl ventricose; aperture patulous. *Remark.* It resembles *Ph. heterostropha*, Say, but is much smaller and thinner.

Randon's Creek, near Claiborne, Alabama, adhering to limestone rocks. (*Conrad.*)

Physa pomilia, CONRAD, Am. Journ. Sc. [1], XXV, p. 343 (1834).—DEKAY, N. Y. Moll. 81 (1843).—MÜLLER, Syn. Test. 1834 Prom. p. 35 (1836).

I have not seen this species, and have not been able to gather any further information regarding it.

Physa virgata, GOULD.—Shell moderate, solid, smooth, elongate-ovate, ash-colored with longitudinal olivaceous stripes; spire elevated, acute; whirls four to five, well separated; aperture lunate, two-thirds the shell's length; columella moderately folded, but with a heavy callus, within yellowish-red. Length $\frac{2}{3}$, breadth $\frac{1}{2}$ inch. Fig. 158.

Found by Dr. T. H. Webb, in the river Gila, and near San Diego.

Physa virgata.

Quite remarkable, as being the only species yet known which has variegated coloration. The stripes are found on some part of every shell, and many are prettily ornamented throughout. In size and proportions it may be compared with *Ph. microstoma*, Hald. (*Gould.*)

Physa virgata, GOULD, Proc. Bost. Soc. Nat. Hist. V, 128 (1855); Otia, 216.

Also found at Los Angelos. An authentic specimen is figured above.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
4285	5	San Diego.	.....	Cabinet series.
4400	5	.....	.....	.....
8723	3	Los Angelos, Cal.	Cab. Acad. Nat. Sc.	.....

Physa troostiana, LEA.—Shell elliptical, rather thick, yellow-brown, smooth; spire obtuse; sutures slightly impressed; whirls five, slightly convex; lip margined, thickened within; aperture small ovate, contracted. Fig. 159.

Hab. Near Nashville, Tennessee: Dr. Troost. My cabinet, and cabinet of Dr. Troost. Diam. .25, length .45 of an inch.

Physa troostiana.

This is a short obtuse species, about the size of *P. aurea*, Nob. The substance of the shell is very thick for the genus, and it is much more thickened within the margin than any species I have observed. The line along the margin of the lip is of a reddish-brown. The indentation of the columella is lower than usual. The aperture is about two-thirds the length of the shell. (*Lea.*)

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Physa troostiana, Lea, Tr. Am. Phil. Soc. IX, 7; Obs. IV, 7 (1844); Proc. II, 32 (1841).

Fig. 159 is drawn from the original specimen.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9266	15	.....	.....	Teste Lea.

Physa triticea, LEA.—Shell subfusiform, pellucid, polished, reddish-chestnut; spire short, subacute; sutures sub-impressed; whirls four, sub-constricted; aperture elongate, with a line within.

Fig. 160.

Physa triticea

Shasta County, California: Dr. Trask. (*Lea.*)

Physa triticea, LEA, Proc. Acad. Nat. Sc. Phila. VIII, 80 (1856).

Mr. Lea's description is given above. My figure is drawn from a shell collected by Dr. Cooper, and determined by Mr. Lea, now in the Smithsonian collection.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9097	3	California.	Judge Cooper.	One figured. Type.
9268	3	.....	.....	.....

Physa concolor, HALDEMAN.—Shell oval, spire produced, with the apex pointed; aperture oval, narrow, with the columella fold distinct. Color honey yellow.

Fig. 161.

Physa concolor.

Characterized by a single specimen brought from Oregon by Mr. Nuttall. (*Haldeman.*)

Physa concolor, HALDEMAN, Mon. pt. III, p. 3, cover (1841); p. 30, pl. ii, f. 10 (1843).—DEKAY, N. Y. Moll. 81 (1843).

I have seen no specimens of this species. Fig. 161 is a copy of that of Haldeman.

SUBGENUS **PHYSELLA**, HALD.

Shell globose, spire short; aperture elongate, very wide; columella with the fold well marked.

Physa globosa, HALDEMAN.—Shell globose, translucent; spire very short and rounded; aperture very long and wide, occupying considerably

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more than half the entire area of the shell; fold well marked; whirls three. FOREIGN ANALOGUE. *Amphipeplea involuta.*

Fig. 162.

This small species inhabits the submerged rocks in the rapids at the mouth of Nolachucky River, in Tennessee, under such circumstances as to convince me that it does not breathe the free air. I procured but two individuals, the shells of which are sufficiently translucent to exhibit light circular dots upon the black ground of the mantle—a common character in this genus. (*Haldeman.*)

Physa globosa.

Physa globosa, HALDEMAN, Mon. pt. 4, p. 4 of cover (1842); p. 38, pl. v, f. 10–12 (1843); Journ. Acad. Nat. Sc. Phila. VIII, 200 (1842); Pr. A. N. Sc. I, 78 (1841).—DEKAY, N. Y. Moll. p. 81 (1843).

Physella globosa, CHENU, Man. de Conch. II, 281, f. 3551.

The description and figure given above are copied from Haldeman, the latter enlarged.

SUBGENUS **PHYSODON**, HALD.

Shell solid, smooth, elliptical; outer lip thick; columella toothed.

Physa microstoma, HALD.—Shell elliptic, composed of four flattened whirls, separated by a distinct but very shallow suture; substance of the shell thick; spire shorter than the aperture, and ending in a point; aperture narrow elliptic, with a continuous peritreme, and the labium much thickened anteriorly; columella with two nacreous elevations or obtuse teeth. Color light brownish-ochraceous; columella and external periodical (varicose) bands, white, whilst the corresponding internal bands are chestnut.

Fig. 163.

Physa microstoma.

Kentucky and Ohio.

This is a remarkable shell, and readily distinguished from all the American species of *Physa*, hitherto described, by the teeth upon the columella. (*Haldeman.*)

Physa microstoma, HALDEMAN, Mon. p. 39, pl. iv, f. 12–14 (1853); Suppl. to pt. 1, p. 2 (1840).

Physiodon microstoma, CHENU, Man. de Conch. II, 481, f. 3552.

Fig. 163 is a fac-simile of one of Haldeman's. His description is given above.

Cat. No.	No. of Sp.	Locality.	From whom received	Remarks.
9095	1	Kentucky.	Haldeman.	Type.

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Spurious Species of Physa.

Physa ampullaria, Say, is mentioned by name only by Lea in Expl. of Nebraska, &c., House Doc. 2d Sess. 35th Cong. 1858–9, vol. II, pt. iii, p. 724. It may be a misprint for *ancillaria*.

Physa rivalis is catalogued without description by J. de C. Sowerby (in Richardson's Fauna Boreali-Americana, III, 315 (1836)), as is also

Physa turrita with *Physa elongata*, Say, and *Bulla hypnorum*, Linn. as synonyms.

Physa scalaris, Jay.—The shell is white, semi-transparent, and very fragile; the sutures of the whirls are very angular, and of the same character with the *Ampullaria scalaris*, D'Orb. It was presented to me by Count Castelneau, whose researches in this country will, without doubt, add much interesting matter to our knowledge of natural history.

Fig. 164.

Physa scalaris.

Hab. Everglades of Florida. (*Jay.*)

Paludina scalaris, Jay, Cat. ed. 3d, 1839, p. 112, pl. i, f. 8, 9.—Reeve, Con. Icon. fig. (1863).

Physa scalaris, Haldeman, Mon. 34, pl. iv, f. 9 (1842).

The original description and figure are given above.

This species is undoubtedly distinct from any other known, but its generic place is doubtful. It does not seem to belong in *Physa* or *Paludina*. Specimens from Tampa Bay have been received by Mr. Anthony. There is a *Physa scalaris*, Dunker.

Physa planorbula, DeKay, see *Planorbis trivolvis*.

Physa marginata, Say, is mentioned by Bell in the Canadian Geological Report for 1858, p. 252. I know of no such species.

Physa fragilis, DeKay, N. Y. Moll. Rep. 1839, 32, is mentioned by name only as a new species.

Physa fontinalis, Sheppard (Tr. Lit. and Hist. Soc. Quebec, I, 195, 1829).—Reversed, oval, transparent, smooth, horn-colored; spire short, subacute. (Near Quebec.) (*Sheppard.*) J. de C. Sowerby also quotes *P. fontinalis* without description, from Methy Lake to Bear Lake, in Richardson's Fauna Boreali-Americana, III, 315; also by G. B. Sowerby in Tankerville Cat. p. 42 (1825); by Michaud in Mag. de Zool. 1837, cl. v, p. 4, and

Physa subopaca, Sheppard (Tr. Lit. and Hist. Soc. Quebec, I, 195, 1829).—Shell reverse, oval, semi-pellucid, grayish-yellow; spire short, acute. This species is rather more common than the foregoing (*P. fontinalis*); they are often found together at the Island; it resembles *fontinalis*, but is not so transparent. It is yellow without and white within. (*Sheppard.*)

Fossil Species of Physa.

Dr. Meek gives me the names of the following fossil species:—

Physa secalina, Evans & Shumard, Pr. Phil. Ac. 1854, 156.

Physa rhomboidea, Meek & Hayden, Pr. Phil. Ac. 1856, 119.

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BULINUS, Adanson.

Tentacles filiform, setaceous. Mantle simple-edged, and not reflexed over the shell. Foot long, acuminate behind.

Shell sinistrorsal, elongated, polished, thin; spire acuminated; aperture narrow, produced anteriorly; inner lip simple; outer lip acute.

Jaw (of *B. hypnorum*) strongly arched, narrow, cartilaginous, brown.

Fig. 165.

Animal of *Bulinus*.[1]

Bulinus differs from *Physa* in having a simple, unfringed mantle. The shell is also more slender and more highly polished. It is less common in North America than *Physa*, but usually appears of a large size. *Bulinus princeps*, Phillips, of Central America, and some of the South American species, are remarkably well developed.

Adanson's name *Bulinus* has priority over *Aplexa*, Fleming, and *Nauta*, Leach, and is accompanied by a careful description and excellent figure.

Bulinus aurantius, Carpenter.—Shell thin, ovate, smooth or marked with very delicate incremental striæ, orange horn colored, brownish on the spire; spire short, always eroded when adult; about seven swollen whirls; aperture somewhat dilated; lip very thin, arcuate; columella scarcely folded.

Fig. 166.

Bulinus aurantius.

This fine species, which is generally named *Physa peruviana* in collections, is quite distinct from the types in the British Museum. It much more nearly approaches *Aplexa maugeræ*, which is believed to be a Caribbæan species (not Californian, as stated by Woodward, Man. II, 171). It differs in shape, which is never so elongated, and in color, which is almost always orange-horn, with a tendency to darker shades in rays, below the suture. Shell swollen, thin, glossy, with an extremely thin columellar lip projecting beyond the aperture, and indented at the base of the body whirl. The length of the spire varies in different specimens, as does

[1] I have been unable to obtain living specimens of a native species to figure. Fig. 165 is from Moquin-Tandon.

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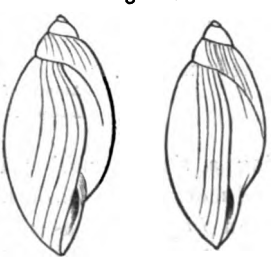
also the amount of convexity. The true *Aplexa peruviana* has a very prominent apex, with shouldered, swollen body whirl. Allowance must be made in the following measurements for the constant erosion of the apex. A slender specimen measures long. 1.23, long. spir. .27, lat. .63. A swollen specimen long. 1.25, long. spir. .24, lat. .7. The largest specimen must have measured 1.43; mean diverg. 60°.

Mazatlan; not common. (*Carpenter.*)

Fig. 167.



B. aurantius. *B. maugeræ.*

Aplexa aurantia, CARPENTER, Brit. Mus. Cat. of Mazatl. Shells, p. 179(1856).
Aplexa peruviana, MENKE, CARPENTER olim, teste CARPENTER, l. c.

The shell figured above (Fig. 166) was received from Mr. Carpenter. Fig. 167 gives a comparison between *Bulinus maugeræ* and *aurantius*. They appear to me very nearly related, if not identical.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9142	1	Mazatlan.	Dr. Gould.	Fig. 166, type.
9215	4	"	Judge Cooper.	.....

Bulinus nitens, PHILIPPI.—Shell longitudinally ovate, acute, imperforate, chestnut brown, very smooth and shining; apical whirls comprising one-fourth the whole length; columellar fold rather prominent, columella short, straight, compressed.

Fig. 168.

Bulinus nitens.

It is the largest species of the genus, the whirls, five to six in number, form a conical apex, with moderate suture, the last one being inflated, smaller in the centre; a surface polished, unbroken by lines of growth, and dark brown color further characterize it; on the suture is a white band reminding one of *Natica glaucina;* columella straight, adherent, short, with a well-defined fold; inner lip thin and adherent throughout, divided into two portions, of which the lower is thicker and more expanded; no umbilicus. Long. $11\frac{1}{4}'''$, diam. $6\frac{1}{4}'''$; ap. $8\frac{3}{4}'''$ long, $3\frac{1}{2}'''$ broad.

Hab. Mexico.

Ph. peruviana, Gray, from its description, appears to resemble it nearly, but differs in having a shorter body whirl, which comprises scarcely a fifth of the whole shell's length, and the whirls are more inflated. (*Philippi.*)

Physa nitens, PHILIPPI in KÜSTER, Ch. ed. 2, p. 5, pl. i, f. 1, 2.

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I have seen no specimen of this species, but do not doubt its belonging to *Bulinus*.

Bulinus elatus, GOULD.—Shell lanceolate-ovate, very thin, smooth and glistening, pale horn-color, colorless at suture; spire acute; whirls nearly six, distinct, slightly convex, the last one seven-eighths the length of the shell, ellipsoidal, nearly symmetrical at the ends; aperture three-fourths the length of the shell, narrow obovate-lunate, acutely rounded anteriorly; having on the pillar an imperfect fold, and a very thin callus on the body whirl. Length seven-eighths of an inch; breadth three-eighths of an inch; length of aperture five-eighths of an inch.

Fig. 169.

Bulinus elatus.

Inhabits Lower California: Maj. Rich.

An elongated species almost as slender as *P. hypnorum*, though very much larger, highly polished, with a very long aperture; pillar region tumid. (*Gould.*)

Physa elata, GOULD, Bost. Journ. Nat. Hist. VI, 379, pl. xiv, f. 4 (1853); Otia, 185.

Aplexa elata, CARPENTER, Br. Mus. Cat. of Mazatlan Shells, p. 180 (1856).

A copy of Gould's description and a figure of an authentic specimen are given above.

It is the thinnest and most delicate of the North American species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9214	1	Mazatlan.	Judge Cooper.	.....

Bulinus hypnorum, LINNÆUS.—Shell heterostrophe, pale yellowish, very fragile, diaphanous, oblong, whirls six or seven; spire tapering, acute at the tip; suture slightly impressed; aperture not dilated, attenuated above, about half as long as the shell; columella much narrowed near the base, so that the view may be partially extended from the base towards the apex.

Fig. 170.

Bulinus hypnorum.

Inhabits shores of Illinois. Length 7-10 inch; greatest breadth 3-10 nearly. Animal deep black, immaculate above and beneath; tentacula setaceous; a white annulation at base.

In the fragility of the shell, this species approaches nearest to *Limnæa columella*. It is very common in stagnant ponds on the banks of the Mississippi. When the shell includes the animal, it appears of a deep black color, with an obsolete testaceous spot near the base on the anterior side. Its proportions are somewhat similar to those of *P. hypnorum*. (*P. elongata, Say.*)

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Physa hypnorum, LINNÆUS, &c.—HALDEMAN, Mon. 36, pl. v, f. 4–9 (1842). —ADAMS, Shells of Vermont, 154 (1842).

Physa elongata, SAY, Journ. Acad. Nat. Sc. II, 171 (1821): BINNEY's ed. 68.—GOULD, Inv. 214, f. 143 (1841).—DEKAY, N. Y. Moll. 81, pl. vi, f. 346 (1843).—ANON. Can. Nat. II, 211, fig. (1857).

Physa glabra, DEKAY, N. Y. Moll. 80, pl. v, f. 83 (1843).

Physa elongatina, LEWIS, Bost. Pr. V, 122, 298 (1855).

Physa turrita, J. DE C. SOWB. Fauna Bor.-Am. III, 315.

Aplexa hypnorum, CHENU, Man. de Conch. II, 481, f. 3556.

From Kansas to the District of Columbia, and from the Atlantic to the Pacific in the British Possessions, ranging as far north as Russian America. It is one of the species common to the three continents.

Mr. Say's type is still preserved in the Philadelphia Academy.

Physa turrita is quoted without description by J. de C. Sowerby in Richardson's Fauna Boreali-Americana (III, 315), with *P. elongata*, Say, and *Bulla hypnorum*, Linn. as synonyms.

Physa elongatina was proposed as a specific name for some forms of *Bulinus hypnorum* by Dr. Lewis. No description was given. Subsequently the specimens were referred to *Physa glabra*, DeKay. The description and figure of the latter now follow:—

Physa glabra, DEKAY.—Shell sinistral, smooth, shining, elongated, with five to six volutions; suture impressed; spire elongated into an acute apex. Body whirl more than half of the total length. Aperture oblong, acute above, rounded beneath, and half of the total length. Columella sinuous, slightly reverted with a faint oblique fold. Deep brownish-orange, approaching to copper. Length 0.4, of aperture 0.2.

This shell, for which I am indebted to Dr. Budd, who obtained it from Lake Champlain, appears in some collections under the name of *P. aurea*, which it resembles in nothing but color. It approaches *P. elongata*, but differs in its impressed suture and the form of its columella. (*DeKay.*)

Fig. 171.

Physa glabra.

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Cat. No.	No. of Sp.	Locality.	From whom received	Remarks.
8087	3	Ann Arbor, Mich.	W. G Binney.	.....
8088	7	Westbrook, Me.	Dr. J. Lewis.	.....
8089	2	Apple Creek, lat. 47°.	.....	.....
8090	1	Yellowstone River.	.....	.....
8091	21	Grand Rapids, Mich.	Dr. J. Lewis.	.....
8094	3	Minnesota.	I. A. Lapham.	.....
8095	9	Milwaukee, Wis.	"	.....
8318	5	Massachusetts.	Dr. J. Lewis.	Cabinet series.
8972	..	Ft. Resolution.	R. Kennicott.	.....
9093	..	Grand Rapids, Mich.	Dr. J. Lewis.	.....
9100	12	Michigan.	"	.....
9102	..	Puget Sound.	Judge Cooper.	.....
9172	4	Grand Rapids. [pine.	A. C. Currier.	.....
9280	500	Yukron, m. of Porcu-	R. Kennicott.	.....
9282	7	Great Slave Lake.	"	.....

Bulinus berlandierianus.—(See Appendix.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9308	3	Texas.	Lt. Couch.	Fig., type.

SUBGENUS **ISIDORA**, EHRENB.

Shell ovate, umbilicated; columella without any fold.

Diastropha of Guilding is also used for this subgenus. I am unacquainted with Ehrenberg's work, but have no doubt that his name is correctly used by H. & A. Adams.

Bulinus integer, HALDEMAN.—Shell oval, with a lengthened, pointed spire; whirls five, convex; suture deep; aperture obtuse posteriorly, peritreme continuous; labium not appressed anteriorly and without a fold. Color very pale yellowish-brown; labium, aperture, and varicose bands white. Sent to me from Indiana by Mrs. Say. (*Haldeman.*)

Fig. 172.

Bulinus integer.

Physa integra, HALDEMAN, Mon. No. 3, p. 3 of cover, 1841; p. 33, pl. iv, f. 7–8 (1843).—DEKAY, N. Y. Moll. 81 (1843).

Aplexus (*Isodora*) *integra*, CHENU, Man. de Conch. II, 481, f. 3556.

My figure is a fac-simile of one of Haldeman's, whose description also is given above.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8110	56	Nolachucky R., Tenn.	.....	.....
8111	6	.....	Dr. J. Lewis.	.....
8112	5	Big Sioux.	.....	.....
8514	3	Tennessee.	.....	Cabinet series.

Bulinus distortus, HALDEMAN.—Shell transverse, short, translucent and umbilicated; composed of three very convex whirls, and having a very deep suture; spire pointed, shorter than the aperture, which is oval, and almost cyclostomous, without any fold upon the labium or columella. Color very light yellowish-gray. Foreign analogue: *P. guildingii*, Sw.

Fig. 173.

Bulinus distortus.

Near St. Louis: Mr. Emerson. Kentucky and Ohio.

I am indebted to G. B. Emerson, Esq., President of the Boston Society of Natural History, for specimens of this curious shell, which were collected (by himself, I believe) near St. Louis. It is remarkable for the contorted spire and entire absence of a columellar fold. (*Haldeman.*)

Physa distorta, HALDEMAN, Mon. 35, pl. v, f. 1–3 (1842); Suppl. to pt. 1, 1840, p. 2.

Fig. 173 is a fac-simile of the outline of one of Haldeman's figures. His description is copied above.

SPURIOUS SPECIES OF BULINUS.

Aplexa suturalis, BECK. Mexico. No description. Index, 117.

Bulinus fontinalis and var. *canadensis*, BECK; without description. Index, 117.

Bulinus pomilius, CONR., BECK, *l. c.* = *Physa.*

Bulinus crassula, BECK, p. 117; no description, and

Var. *typica* (= *P. heterostropha*);

b. *striata* (= *P. striata*, MKE.);

c. *minor* (= *P. arctistropha*, CRIST. & JAN).

Bulinus subaratus, BECK, Ind. p. 118 = *Physa heterostropha?*

Bulinus gyrinus, BECK, *l. c.* 118 = *Physa gyrina.*

Bulinus maugeræ. See *Bulinus aurantius.*

FOSSIL SPECIES OF BULINUS.

Dr. Meek furnishes me with the following list:—

Aplexa longiuscula, MEEK & HAYDEN, MSS. (*Physa longiuscula*, Pr. Phila. Acad. 1856, 119.)

Aplexa subelongata, MEEK & HAYDEN, MSS. (*Physa subelongata*, Pr. Phila. Acad. 1856, 120.)

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PLANORBIS, Guettard.

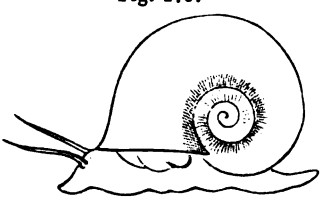
Fig. 174.

Animal of *Planorbis bicarinatus.*

Tentacles slender, filiform. Foot short, ovate.

Shell dextral, discoidal; spire depressed, whirls numerous, visible on both sides; aperture crescentic, or transversely oval; peristome thin, incomplete, the upper margin produced.

Fig. 175.



Animal of *Planorbis.*

Jaw single, superior, arched.

Lingual membrane — ?

The genus *Planorbis* is widely distributed over the globe, but usually prefers the more temperate regions. It is found in every part of this continent, reaching into Mexico, and apparently much more abundant there than the other genera of the family.

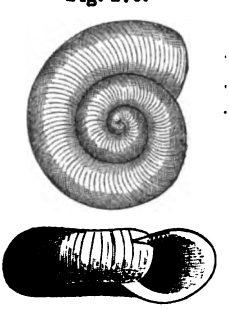
Most of the sections or subgenera are represented in North America. The South American *Taphius* is most nearly allied to the *Carinifex* of the Pacific coast.

The name *Planorbis* is now universally applied to the genus.

The species of this genus have a dextral shell, but the orifices of the generative, excretory, and respiratory organs are on the left of the animal, as in *Physa.* They are sluggish in their habits, preferring stagnant pools.

Say considered the shells sinistral, a fact which must be borne in mind while studying his descriptions. On this account I have represented the facsimiles of his figures in a different position from those of other authors.

Fig. 176.



Planorbis subcrenatus.

Planorbis subcrenatus, Cpr.—Shell tumid, very thin, horn-colored; whirls six, rounded, sutures impressed; with sharp radiating, somewhat crowded and occasionally minutely crenulated, ridges; aperture rounded, parietal wall small, scarcely touching the penultimate whirl; labrum slightly deflected, fuscous within; umbilicus deep. Long. .05, lat. .08, alt. .36. 8

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Oregon. T. Nuttall collected a single specimen.

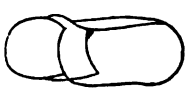
"Differs from *Pl. trivolvis*, Say, in the acuteness of the ribs, and in their being more distant." Cuming MS. (*Carpenter.*)

Planorbis subcrenatus, CARPENTER, Proc. Zool. Soc. 1856, p. 220.

The above is the original description of Mr. Carpenter. The specimen from which it was drawn is figured in my Fig. 176. It has been found in Washoe (*Newcomb*).

Planorbis lentus, SAY.—Shell dull brownish or yellowish-brown, sub-carinate above, particularly in the young shell; whirls nearly five, striate across with fine raised, subequidistant lines, forming grooves between them; spire concave; aperture large, embracing a large portion of the penultimate volution; labrum more acutely but not very prominently arcuated above, its basal portion horizontally subrectilinear, in the adult, and not extending below the level of the base.

Fig. 177.



Planorbis lentus.

I obtained this species in the canal at New Orleans, and am indebted to Mr. Maclure, and also to Mr. Barabino, for many fine specimens collected in the vicinity of that city. I also found the same species at Ojo de Agua, Mexico, when travelling in that country with Mr. Maclure. It differs from the *P. trivolvis* in having the labrum less prominent above, and the basal portion of this part being in the adult horizontally subrectilinear, so as not to touch a plane on which the base of the shell may rest; the aperture also is more transverse. (*Say.*)

Planorbis lentus, SAY, Am. Conch. pt. 6, pl. iv, f. 1 (1834): BINNEY'S ed. 210, pl. iv, f. 1.—HALDEMAN, Mon. 18, pl. iii, f. 4–6 (1844).—DE KAY, N. Y. Moll. 60, pl. v, f. 80*, *a*, *b* (1843).—ANON. Can. Nat. II, 203 fig. (1857) (not GLD. = *fallax*).

Fig. 177 is a fac-simile of that of Mr. Say, whose description also is given above.

It is said to have been found at several points between New Braunfels, Texas, and South Carolina, and in New York.

Prof. Adams refers the species to *Pl. corpulentus* in the List of Middlebury Shells, to *trivolvis* in the Shells of Vermont.

Gould's description and figure of *Pl. lentus* is referred by Haldeman to *Pl. fallax.*

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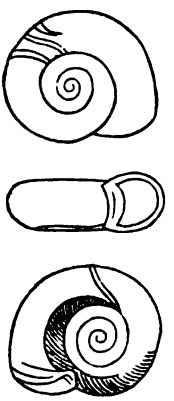
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8178	3	Yellowstone River.	.....	.....
8198	40	Big Sioux.	.....	.....
8496	3	.....	W. G. Binney.	Cabinet series.
9184	2	South Carolina.	Gen. Totten.	.....
9186	5	Lynn, Mass.	Dr. Prescott.	.....

Planorbis tumidus, Pfeiffer.—Shell opaque, pale horn-colored or smoky, densely and finely striated, umbilicated above, slightly concave below; whirls five, convex, sub-carinated on each side, rapidly increasing, separated by a deep suture; aperture oblique, lunate-rounded, somewhat kidney-shaped.

Fig. 178.



Planorbis tumidus.

Shell rather large, and somewhat shining, pale horn-colored, or sometimes reddish-brown or greenish, thick and delicately grooved; concave and deeply umbilicated in the centre above, as also below, without the well-defined umbilicus, so that the apical whirls are visible; whirls five or five and a half rapidly increasing, separated by a deep suture, and obsoletely grooved above and below; mouth oblique, roundly-lunate and somewhat obtusely angular; columella simple, covered with a thin white callus. Greater diameter of the largest specimen 9 lines, height at the aperture 3 lines.

Hab. Common at San Juan (Pfeiffer), Havana (de la Sagra), swamps at Vera Cruz and Vamba (Leebmann, Hegewish), Mexico (D'Orbigny).

Nearly allied to *Plan. tenagophilus*, D'Orb. Young specimens resemble a flat form of *Pl. trivolvis*. Some kindly sent by Prof. Steenstrup, of Copenhagen, are characterized by stouter, smaller shell, and finer grooves, and also paler color (pl. v, f. 1–3) (*Küster, l. c.*).

Planorbis tumidus, Pfeiffer in Wiegm. Archiv. 1839, 354; in Küster, Ch. ed. 2, p. 39, pl. vii, f. 10–12; pl. ix, f. 1–3.

Planorbis caribæus, Orbigny, Sagra's Cuba, 193, pl. xiii, f. 17–19.

Planorbis intermedius, Philippi, Conch. Cab. I, tab. i, 17, 16, f. 18, 19.

Var. fig. malac. an. *Plan. capillaris*, Beck? Ind. p. 110.

Guatemala: Rev. H. B. Tristam. The description and figures given above are copied from Chemnitz, ed. 2.

I have followed Küster in quoting the synonymy of this species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8174	4	Texas.	Lt. Couch.	"Forests."
8175	8	"	G. Wurdeman.	.....
8176	11	"	" & Dr. Ber-	.....
8177	29	"	Lt. Couch. [landiére.	.....
8502	..	"	"	Cabinet series.

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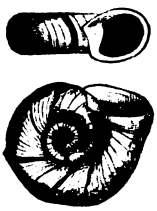
Planorbis glabratus, Say.—Shell sinistral; whirls about five; glabrous or obsoletely rugose, polished, destitute of any appearance of carina; spire perfectly regular, a little concave; umbilicus large, regularly and deeply concave, exhibiting all the volutions to the summit; aperture declining, remarkably oblique with respect to the transverse diameter. Breadth nearly nine-tenths of an inch.

Fig. 179.



Planorbis glabratus.

Inhabits South Carolina. Cabinet of the Academy.

Presented to the Academy by Mr. L'Hermenier, of Charleston, an intelligent and zealous naturalist. He assured me that this species inhabits near Charleston. It somewhat resembles large specimens of the *P. trivolvis*, of the American edition of Nicholson's Encyc., but differs in the total absence of carina, and in having a more smooth and polished surface, as well as a declining and more oblique aperture, and a more profound and much more regularly concave umbilicus. (*Say.*)

Planorbis glabratus, Say, Jour. Acad. Nat. Sc. I, 280 (1818); Nich. Enc. 3d ed. (1819): Binney's ed. p. 51, 61.—Haldeman, Mon. 11, pl. ii, f. 1–3 (1844).—DeKay, N. Y. Moll. 66 (1843).

It is said to be found in Mexico, Louisiana, and Oregon, which, with Say's locality, gives a wide range to this species.

My figure of *Pl. glabratus* is drawn from a specimen corresponding with that figured by Haldeman, and generally acknowledged to be this species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8195	17	St. Simon's Island, Ga.	Dr. J. Lewis.	.....
8500	5	"	"	Cabinet series.

Fig. 180.

P. tumens.

Planorbis tumens, Carpenter.—Shell rapidly swelling, small, horn or reddish smoke-colored; whirls four or five, with light waving striæ; sutures deeply impressed; on one side subangulate or subcarinate near the suture, on the other rounded; umbilicus very deep; aperture with a sinuous edge, one side standing out above, flattened below, the other flattened above, produced below, capacious and rounded; labium very thin.

This species is so variable that it is difficult to describe it so as to include all the specimens and yet separate it from its congeners. Aberrant individuals on the one side closely approach *P. affinis*, on the other *P. lentus*, Say. The three may hereafter be proved identical; but the general habit of *P. tumens*, as gathered from repeated examinations of many hundred specimens, is sufficiently distinct from the Jamaica

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species. The whirls are more rapidly enlarging, more swollen, and the lip more shouldered. An unusually large specimen measures long. .63, lat. .58, alt. .27.

Hab. Mazatlan; not uncommon. Liverpool collection. (*Carpenter.*)

Planorbis tumens, CARPENTER, Brit. Mus. Mazatlan Cat. 181.

Planorbis affinis, CARPENTER in Cat. Prov. (not ADAMS).

Planorbis tenaglophilus, MENKE, Zeit. f. Mal. 1850, p. 163 (not D'ORBIGNY, teste CARPENTER).

Fig. 180 is drawn from a specimen received from Mr. Carpenter. The original description is given above.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9125	5	San Francisco.	Judge Cooper.	.....
9121	11	Petaluma.	Dr. Gould.	Type.
9146	1	.....	"	Figured. Authentic.

Planorbis havanensis, PFEIFFER.—Shell discoid, thin, pale horn-colored or yellow, very delicately and densely striate; above and below planulate, and having an umbilicus in the centre; whirls five, subrotund, moderately increasing, separated by a deep suture; aperture oblique, roundly lunate.

Fig. 181.

Planorbis havanensis.

Shell discoid, thin, fragile, pale horn or yellowish in color, with very delicate and numerous striæ; both above and below flattened and umbilicate in the centre, but somewhat more deeply so above; whirls five, regularly increasing, rounded, separated by a tolerably deep suture; aperture oblique, round, somewhat lunate. Diam. (greatest of largest specimen) about 4 lines, height 1½.

Received from Herr Dr. L. Pfeiffer, who found it in swamps near Havana. Also from Dr. F. Röemer, who found it in Texas.

It has many analogies with *Pl. peregrinus*, D'Orb., of Chile. (*Küster.*)

Planorbis havanensis, PFEIFFER in Wiegm. Arch. f. Nat. 1839, I, p. 354. —KÜSTER in CHEMNITZ, ed. 2, p. 58, pl. x, f. 32–34.

Planorbis terverianus, D'ORBIGNY, Voy. Cub. 194, tab. xiii, f. 20–23.

I have seen no specimen of this species; the above extracts and figures are from the second edition of Chemnitz.

The following is Pfeiffer's description:—

Planorbis havanensis.—Shell discoidal below, above more concave, light horn-color; whirls four, regularly increasing, terete; aperture lunate. Diam. 5, alt. 1½‴. (*Pfeiffer.*)

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Planorbis liebmanni, DUNKER.—Shell discoidal, pale horn-colored, subvitreous, substriate, almost smooth, shining, flattened above, concave below, umbilicated on both sides; whirls four, convex, moderately increasing; aperture per-oblique, slightly dilated, rather rounded, almost heart-shaped.

Fig. 182.

Planorbis liebmanni.

Shell discoid, light horn-colored, very delicately striate, almost smooth, very transparent and shining; flat or slightly convex above, below somewhat concave; umbilicate on both sides; whirls four, rounded, slightly involute, compact, separated by a somewhat deep suture; aperture very oblique, somewhat widened, irregularly rounded, almost heart-shaped. Greatest diam. 3½ lines, height hardly 1 line.

Hab. Vera Cruz: Herr Prof. Liebmann, of Copenhagen.

Specimens kindly furnished by Herr Prof. Steenstrup, of Copenhagen, have a hard, firm, chalky incrustation. (*Dunker.*)

Planorbis liebmanni, DUNKER in CHEMN. ed. 2, p. 59, pl. x, f. 32–34.
Planorbis gracilentus, GOULD, Pr. Bost. Soc. V, 129 (1855); Otia, 217.

Römer (Texas) quotes it from New Braunfels. The above description and figure are from Chemn., ed. 2.

Planorbis gracilentus, Gould, appears to be identical with this species. It is, at least, the same as the shells in Nos. 8179, 8180, and 8504, which I have referred to *Plan. liebmanni* after a study of the description and figures copied above. No. 9205, from the Colorado Desert, is an authentic specimen of Gould's *Pl. gracilentus*. His description here follows, and an enlarged drawing of a specimen received from him. Dr. Gould suggests its identity with *Pl. haldemani*, but the aperture of that species is campanulate.

Planorbis gracilentus, GOULD.—Shell discoidal, compressed, white, finely striated; right side flattened; left side moderately concave; on each side four rounded whirls, the last obtusely carinated at the periphery; aperture quite oblique, roundedly oval. Axis $\frac{1}{5}$, diam. ½ inch.

Fig. 183.

Planorbis gracilentus.

Found by Dr. T. H. Webb, in the great Colorado Desert low lands.

No North American species, of equal size, can be compared with this well-marked, wheel-shaped species. Very small specimens are like large specimens of *P. deflectus*, Say. A species from the Nile is very similar. (*Gould.*)

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8179	2	Texas.	G. Wurdeman.	.....
8180	25	"	Lieut. Couch.	.....
8504	8	"	"	Cabinet series.
9205	1	Colorado Desert.	A. A. Gould.	(Type of *Pl. gracilentus* figured.)

Subgenus **PLANORBELLA**, Hald.

Shell with the whirls few; aperture campanulate or bell-shaped, prominent.

Planorbis campanulatus, Say.—Sinistral; whirls longer than wide; aperture sub-campanulate.

Inhabits Cayuga Lake. Cabinet of the Academy.

Shell sinistral, not depressed; whirls four, slightly striate across; longer than wide; spire hardly concave, often plane; body whirl abruptly dilated near the aperture and not longer behind the dilatation than the penultimate whirl; suture indented, well defined to the tip, the summits of the volutions being rounded; aperture dilated; throat narrow abruptly; umbilicus profound, the view extending by a minute foramen to the apex. Greatest length of the body whirl one-fourth of an inch; breadth from tip of the labrum one-half of an inch; at right angles to the last, two-fifths of an inch.

Fig. 184.

Planorbis campanulatus.

This shell abounds in some of the small streams which discharge into Cayuga Lake, where it was collected by Mr. Jessup, who presented specimens to the Academy and to me. It is readily distinguished from other species, by the sudden dilatation of the outer whirl, near the aperture in the adult shell, forming a large oval chamber. The summit of the outer whirl, behind the dilated portion, is not, or hardly elevated above the summits of the other volutions. (*Say.*)

Planorbis campanulatus, Say, Jour. Acad. Nat. Sc. II, 166 (1821): Binney's ed. p. 64.—Haldeman, Mon. 9, pl. i, f. 7-11 (1844).—Gould, Invert. 204, f. 133 (1841).—Adams, Shells of Vt. 155 (1841).—De Kay, N. Y. Moll. 61, pl. v, f. 99* *a*, *b* (1843).—Küster in Chemn. ed. 2, p. 52, pl. ix, f. 7-10.—Anon. Can. Nat. II, 204, fig. (1857).

Planorbis bellus, Lea, Tr. Am. Phil. Soc. IX, 6 (1844); Proc. II, 32 (1841).

Planorbis bicarinatus, Sowerby, Gen. pl. iv.

Planorbella campanulata, Chenu, Man. de Conch. II, p. 482, f. 3559.

Helix angulata, Sheppard, teste J. de C. Sowerby, Fauna Boreali-Americana, III, 315.

It ranges from New England through the northern tier of States to Minnesota.

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My decisions in regard to the synonymy of this species are based on actual examination of Mr. Lea's type of *Pl. bellus*, which is an immature shell, and the description copied below.

Planorbis bellus, LEA.—Shell orbicular, above regularly concave, beneath widely umbilicate, greenish-yellow, closely and beautifully striate; whirls four, carinate above, sub-carinate below; lip sharp, aperture small, within reddish-brown.

Hab. Tennessee: Dr. Troost. My cabinet, and cabinet of Dr. Troost. Diam. .40, length .22 of an inch.

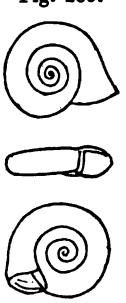
A single specimen only of this species was received from Dr. Troost. Like the *P. corpulentus* (Say), it is covered with striæ, but in the *bellus* they are much closer and more regular. It is a much less inflated shell, and more regular in its form. (*Lea.*)

Planorbis bicarinatus of Sowerby's Genera of Shells seems to represent this species rather than *bicarinatus*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8199	3	Milwaukee, Wis.	I. A. Lapham.	.....
8201	2	Lake of the Woods.	R. Kennicott.	.....
8202	1	Quasquitan, Ia.	E. C. B.	.....
8203	1	Big Sioux.	.....	.....
8204	3	San Cloud, Min.	R. Kennicott.	.....
8205	11	Little Lakes, N. Y.	Dr. J. Lewis.	.....
8206	35	.....	.....	.....
8207	1	Aztalan, Wis.	S. F. Baird.	.....
8495	3	Michigan.	W. G. Binney.	Cabinet series.
9178	100+	Vermont.	Chittenden.	.....
9181	5	Lynn, Mass.	Dr. Prescott.	.....
9281	9	Otter Tail Creek, Min.	R. Kennicott.	.....
9266	4	Great Slave Lake.	"	.....

Planorbis haldemani, DUNKER.—Shell discoidal, depressed, rather solid, pale horn-colored (?), obsoletely striate, rather concave both above and below, almost flat, pitted in the middle of each side; whirls five, oval, rather involute; aperture ovate heart-shaped, dilated, almost campanulate.

Fig. 185.



Planorbis haldemani.

Shell discoidal, flat, rather solid, delicately striate, very slightly concave above and below, as well as almost flat, with a pit in the centre. Whirls five, moderately increasing, not very involute, ovately-rounded. Aperture oval, almost heart-shaped, widened, resembling that of *Plan. campanulatus*, which is bell-shaped. Greatest diam. 6 lines, height almost 2 lines.

Mexico: Prof. Liebmann.

The specimens are worn, but apparently were pale horn-colored when fresh. (*Küster.*)

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Planorbis haldemani, DUNKER in CHEMN. ed. 2, p. 59, pl. x, f. 38–40 (not ADAMS).

The above are copies of the original description and figures of this species.

The name has been used by Adams, Contr. to Conch. III, 43, Oct. 1849. This will probably necessitate another name for Dunker's shell. I cannot ascertain the date of his description in the second edition of Chemnitz.

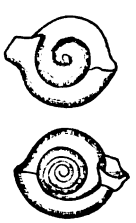
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8196	31	Lake Aculeo, 30 m. S. S. W. of Santiago.	.....	"Thrown upon the beach."
8499	3	Lake Aculeo, 30 m. S. S. W. of Santiago.	.....	Cabinet series.

SUBGENUS **ADULA**, H. ADAMS.

Shell with the whirls rounded and numerous, deeply umbilicated on the upper, and convex on the under side; aperture campanulate.

Planorbis multivolvis, CASE.—Shell about five-eighths of an inch in diameter; whirls seven, about half the last whirl overlapping the preceding one, sometimes the last whirl suddenly distorted and expanded for the last half of its length; right side concave, left side slightly acuminate and considerably carinate; throat campanulate; aperture opening towards the left, but projecting on both sides beyond the preceding whirl.

Fig. 186.



Planorbis multivolvis.

This shell, also, I obtained from Captain Stanard, who found it in the northern part of Michigan. It is very distinct from any *Planorbis* I have met with, or have been able to find any description of. I have named it from its strong characteristic—a greater number of whirls than usual in the genus. (*Case.*)

Planorbis multivolvis, CASE, Am. Journ. Sc. [2], III, 101, f. 4, 5 (1847).

Adula multivolvis, H. ADAMS, Proc. Zool. Soc. Lond. 1861, p. 145.

I have heard of this very peculiar species being found at no other locality. No. 9122 of the collection was received from Mr. Case by Dr. Gould, and by him presented to the collection. The original description and figure are given above.

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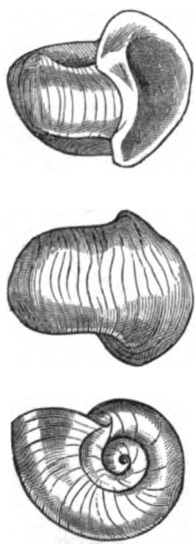
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9122	1	.....	Dr. Gould.	.....

SUBGENUS **HELISOMA**, SWAINS.

Shell ventricose, the spire sunk below the body whirl; whirls few, often angulated.

Planorbis ammon, GOULD.—Shell large, discoid, subconic, delicately striate; left side broadly and deeply concave, showing four obtusely carinated whirls; right side concave, showing two and a half rounded whirls; aperture ovate-triangular, sometimes quite expanded on each side; axis $\frac{5}{8}$ to 1, diam. $\frac{1}{4}$ to $\frac{1}{2}$ inch.

Fig. 187.



Planorbis ammon.

Found by Dr. T. H. Webb, in the Cienaga Grande, or Colorado Low Desert, and also by Mr. W. P. Blake.

The specimens differ greatly in size, and in the development of the aperture; but all agree in the peculiar slope of the outer volution, giving them a conical or dome-shaped form when lying on the left side. Fully developed specimens are much like *P. corpulentus*, Say, but the shape of the volution and aperture differ, and the striæ are less coarse, and more like *P. glabratus*, Say. (*Gould.*)

Planorbis ammon, GOULD, Proc. Bost. Soc. Nat. Hist. V, 129 (1855); Otia, 216; Pac. R. R. Rep. V, 331, pl. xi, f. 12–18 (1857); Prel. Rep. 23 (1855).

Planorbis traskii, LEA, Pr. Phil. Acad. Nat. Sc. 1856, VIII, 80.

It is also said to have been found in lagoons, Sacramento Valley, and Ocogo Creek, California. Fig. 187 is copied from those of Gould.

No. 9169 of the collection was labelled "*P. traskii*," by Dr. Trask. It appears to be identical with Gould's shell. Fig. 188 is drawn from Mr. Lea's original specimen of *P. traskii*, and his description is given below.

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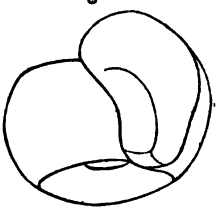
Planorbis traskii, LEA.—Shell large, dark horn-colored, subcylindraceous, minutely, regularly and closely striated, deeply and broadly umbilicated above; more excavated below; whirls five, acutely carinated at the periphery above, obtusely carinated below; aperture ear-shaped.

Kern Lake, Tulan Co., California: Dr. Trask. (*Lea.*)

Fig. 188.

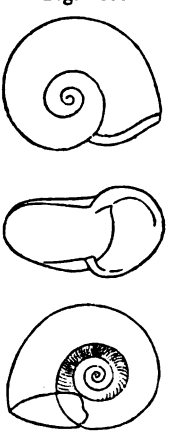


Planorbis traskii.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8576	3	Ocogo Creek, Cal.	Lt. R. S. Williamson.	"Varying from type," A. A. G. Cab. ser.
9124	1	Kern Lake, Cal.	Dr. Cooper.	(Sub nomine *traskii*.)
9169	1	Monterey County, Cal.	Dr. Trask.	"
9258	7	Klamath Lake, Or.	Newberry.	.....
9260	7	Rhett Lake, Cal.	"	.....
9317	12	E. of Ft. Colville, W. T.	N.W. Boundary Surv.	.....

Planorbis tenuis, PHIL.—Shell large, thin, rather shining, very delicately striate, pale horn or smoke-colored; concave on each side, umbilicated above, deeply excavated below; whirls swollen, rounded, above narrow, subcarinated below and rapidly increasing; aperture sinuous, sub-auriculate. (*D.*)

Fig. 189.



Planorbis tenuis.

Shell large, very thin, densely and sharply grooved, transparent, pale horn-color, yellowish or sometimes reddish-brown, not very highly polished; five rapidly increasing involute whirls, rounded and ventricose above, below narrow and grooved near the suture; carina usually more prominent on the inner whirls, being often obsolete on the body whirl. Upper side umbilicated, so that the deeply depressed first whirl is covered by the rest; the under side, on the other hand, is almost funnel-shaped, yet flat in the middle. The auricular aperture is somewhat raised above; the parietal wall has a very delicate callus. Breadth 7–9 lines, height 3¾–5 lines.

Common among graves near Mexico, with *Limnæus subulatus*, Dkr.: Schiede and David.

Resembles *Plan. peruvianus*, Brod., which has a smaller, thicker shell, and very thick and broad lip. (*Küster.*)

Planorbis tenuis, PHILIPPI, Conch. tab. I, 17, 16, f. 23–25.—KÜSTER IN CHEMN. ed. 2, 45, pl. ix, f. 14–19.

Planorbis mexicanus, ZIEGLER in litt.

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The above description and figure are copied from Chemnitz, ed. 2.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8172	7	City of Mexico.	Maj. Rich.	.....
8506	5	"	"	Cabinet series.

Planorbis corpulentus, SAY.—Shell dextral; whirls more than three, rather rugged with coarse wrinkles, much higher than wide; superior surface much flattened, and edged by an abrupt acute line, which is distinct to the aperture; sides hardly rounded and terminating below by another abrupt edge, which is not quite so definite and acute as the superior one; spire slightly concave; umbilicus exhibiting a portion of each of the rapidly retiring whirls to the apex; aperture longer than wide, the superior part extending higher than the preceding volution, and the inferior volution declining much lower than the inferior line of the same volution. Greatest breadth three-fourths of an inch; length of aperture nearly half an inch; length of the penultimate whirl near the aperture rather more than three-tenths of an inch.

Fig. 190.

Planorbis corpulentus.

Inhabits Winnepeck River, Winnepeck Lake, Lake of the Woods, and Rainy Lake; common.

Of this species I collected numerous specimens, but had the misfortune to lose them all, as well as a great number of interesting terrestrial and fluviatile shells, on our return to the settlements, and I am indebted to the liberality of Dr. Bigsby for the individual above described. It is closely allied to *trivolvis*, Nob., but is much less rounded on the sides of the whirls, the carinæ are more prominent, the upper side is much more horizontally flattened, the labrum is less rounded, and the whole shell is larger and higher in proportion to its width, and the aperture extends both above and below the penultimate whirl. (*Say.*)

Planorbis corpulentus, SAY, Long's Ex. II, 262, pl. xv, f. 9 (1824): BINNEY's ed. p. 128, pl. lxxiv, f. 9.—? HALDEMAN, Mon. 19, pl. iii, f. 7–9 (1844) —? GOULD, U. S. Ex. Ex. Moll. 114, f. 130, 130 *a*, 130 *b* (1852).

?*Helisoma corpulenta*, CHENU, Man. de Conch. II, 482, f. 3560.

Animal dark emerald green, profusely dotted above and below with small white points, paler beneath. Head large, tentacles very slender. (*Gould.*) See Fig. 175, p. 103.

I am inclined to believe that Say had before him a form of *Plan. trivolvis* when he drew his description of *Plan. corpu-*

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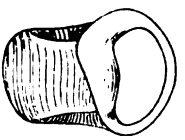
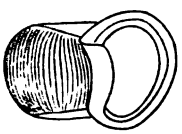
lentus. His original description and figure are given above. Large globose forms of *Pl. trivolvis* are usually called *Pl. corpulentus* in collections, and have often been so labelled in the envois of my correspondents. DeKay also describes and figures a specimen of *P. trivolvis* as *Pl. corpulentus*. Adams (Shells of Vt.) refers *P. corpulentus* to *Pl. trivolvis*, and so Gould appears to decide in the Invert. of Mass. I have myself seen no specimens from the localities visited by Mr. Say while on Long's Expedition that are not forms of *Pl. trivolvis*.

Fig. 191.



Form of *Pl. corpulentus*.

Fig. 192.



Form of *Pl. corpulentus*.

The shells referred to *Pl. corpulentus* by Haldeman in his Monograph, by Gould in the Exploring Expedition Mollusca, and figured by Chenu (*l. c.*), and referred to in the following museum register, are all from the West Coast. I believe them to be distinct from *Pl. corpulentus* of Say, and that they should receive another specific name. The description of the animal given above is drawn from one of this form. One of Haldeman's figures is copied in my Fig. 192. It will be found to agree with Fig. 191, drawn from one of the specimens in the Smithsonian collection, No. 8119. A curiously indented form from the West Coast is figured in Fig. 193.

Fig. 193.

Form of *Pl. corpulentus*.

P. corpulentus is catalogued from Guatemala by Mr. Tristam.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8116	1	Pacific Coast.	.....	.....
8117	12	"	.....	.....
8118	8	Columbia River, Or.	Com. Wilkes.	.....
8119	5	" ?	.....	.....
8120	14	Pacific Coast.	.....	Young.
8121	..	"	.....	.....
8460	..	Columbia River, Or.	Com. Wilkes.	Animal in alcohol.
8498	2	.....	J. G. Anthony.	Cabinet ser.
8575	4	Columbia River, Or.	Com. Wilkes?	" " W. C.
9119	1	Washington Territory	"	Fig. 193.

Planorbis trivolvis, SAY.—Shell sinistral, pale yellow, brownish or chestnut color, subcarinate above and beneath, particularly in the young shell; whirls three or four, striate across with fine, raised, equidistant, acute

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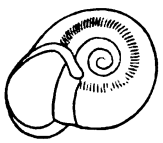
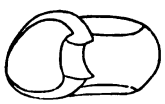
lines, forming grooves between them. Spire concave; aperture large, embracing a considerable portion of the body whirl, within bluish-white; lip a little thickened internally, and of a red or brownish color, vaulted above; umbilicus large, exhibiting the volutions. Length one-fourth of an inch; breadth one-half of an inch. Animal aquatic, dark ferruginous, with very numerous, confluent, pale yellowish points; tentacula long, setaceous, with confluent points; foramen on the left side.

Fig. 194.





Planorbis trivolvis.

That ingenious naturalist, Mr. C. A. Lesueur, found this species of a much larger size in French Creek, near Lake Erie; breadth three-fourths of an inch nearly; color almost black, purplish-red within the mouth.

Lister (*Cochlea trium orbium*, Lister, Conch. tab. cxl, f. 46) figures this shell pretty accurately, and it is referred to in Gmelin's edit. of Syst. Nat. p. 3615, as *albella*, but it is certainly not that species. (Petiver, Gazophyl. pl. cvi, f. 17.)

This is an inhabitant of the Middle and Northern States, and is very common in many districts. I have found it in Pennsylvania, New Jersey, Delaware, Maryland, Falls of Niagara, Upper Canada, and in the vicinity of Council Bluff on the Missouri. Dr. Eights sent me specimens from Albany, New York, and Mr. Jessup gave several from Cayuga Lake. Lister gives two pretty good figures of this shell, and quotes Virginia as the native locality. Muller, Gmelin, and Dillwyn incorrectly referred to Lister's figures as *Helix albella;* but the latter author, in his edition of Lister, agrees with us in considering them as representations of the present species. (*Say.*)

Planorbis trivolvis, Say, Nich. Ency. pl. ii, f. 2 (1817, 1818, 1819); Am. Conch. pt. 6, pl. liv, f. 2 (1834): Binney's ed. p. 44, pl. lxx, f. 2; pl. liv, f. 2.—DeKay, N. Y. Moll. 59, pl. iv, f. 59, *a*, *b* (1843).—Gould, Inv. of Mass. 201, f. 131 (1841).—Haldeman, Mon. 13, pl. ii, f. 4–7 (1844).—Adams, Shells of Vt. 154 (1842).—Küster in Chemn. ed. 2, p. 53, pl. v, f. 4–6; pl. vi, f. 1–6, 20–25.—Potiez et Michaud, Gal. des Moll. I, 214, pl. xxi, f. 19–21.—Anon. Can. Nat. II, 202, fig. (1857).

Bulla fluviatilis, Say, Jour. Acad. Nat. Sc. II, 178: ed. Binn. 71.

Planorbis regularis, Lea, Tr. Am. Phil. Soc. IX, 6; Proc. II, 32 (1841); Obs. IV, 6.

Planorbis megastoma, DeKay, N. Y. Moll. 61, pl. iv, f. 60, 61 (1843).

Physa planorbula, DeKay, N. Y. Moll. 76, pl. v, f. 83 (1843).

Planorbis corpulentus, DeKay, N. Y. Moll. 64, pl. xiii, f. 185 (1843).—Whittemore, Am. Journ Sc. [1], XXXVIII, 193.

?*Planorbis proboscideus*, Potiez & Michaud, Gal. des Moll. I, 213, pl. xxv, f. 13-15 (1838).

Planorbis macrostomus, Whiteaves, Can. Nat. VIII, 113, fig. (1863).

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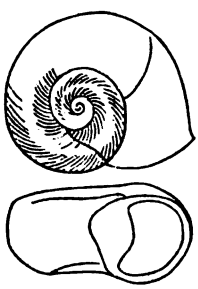
Planorbis trivolvis, var. *fallax*, HALDEMAN, Mon. 15, pl. iii, f. 1–3 (1844).
Planorbis lentus, GOULD, Inv. 202, f. 132 (1841).
Helix trivolvis, EATON, Zool. Text-Book, 194 (1826).
Cochlea trium orbium, LISTER, Conch. pl. cxl, f. 46.—PETIVER, Gazophyl. pl. cvi, f. 16.

This species probably inhabits all of the United States and Canada. It has been found at Fort Simpson, to the Red River of Louisiana, from Puget Sound to San Diego; in Utah, and from New England through the Western and Middle States. Poey catalogues it among the Cuban shells.

Fig. 195.



Planorbis trivolvis.

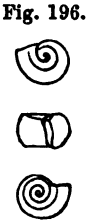
Fig. 195 is a better representation of the species than the fac-simile of Mr. Say's figure given in Fig. 194.

I give below the original descriptions of the synonyms of this species. Of these *Physa planorbula*, *Bulla fluviatilis*, and *Planorbis regularis* are immature forms. *Plan. megastoma* and *Plan. macrostomus* are an overgrown form or monstrosity. All the following figures are fac-similes excepting Fig. 196, which was drawn from the original specimen of Mr. Lea.

Haldeman quotes *Pl. regularis* as a synonym, and Adams *Pl. lentus* and *corpulentus*.

Planorbis regularis, LEA.—Shell subglobose, above nearly flat, beneath narrow, umbilicate, pellucid, pale yellow, obsoletely striate; whirls three, above carinate; lip acute, margined, within thickened; aperture ovate.

Fig. 196.



Planorbis regularis.

Hab. United States. My cabinet, and cabinet of P. H. Nicklin. Diam. .30, length .20 of an inch.

I have unfortunately mislaid the label which accompanied the shells from which the above descriptions were made. My impression is that they came from one of the Western States. All the specimens before me are very much alike in size and form—being exceedingly regular. The striæ are more perceptible around the umbilicus and on the spire. On the side they are so much obliterated as to permit the whirl to present a shining appearance. The carina is very sharp and well defined. It has very much the appearance of a young *trivolvis*, Say, and may possibly be only a variety of that species. (*Lea.*)

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Bulla fluviatilis, SAY.—Shell suboval, pellucid, pale yellowish-white finely wrinkled; volutions three; body whirl large, with a prominently carinated shoulder bounding the spire; spire perfectly flat or slightly concave, giving to the shell a perfectly truncated appearance in that part; aperture longer than the columella, oblong-ovate, extending beyond the tip of the spire; umbilicus profound, edged by a slight carina. Length of the aperture one-fifth of an inch; greatest breadth somewhat less.

Inhabits the river Delaware. This species seems to be rather rare; it was discovered by Mr. Aaron Stone, deeply imbedded in the mud. Mr. William Hyde, of this city, has since found specimens of it amongst some dead shells of other genera assembled in a small inlet of the river. (*Say.*)

Physa planorbula, DEKAY.—Shell small, thin and fragile, sinistral, cylindrical above, tapering beneath, abruptly truncated on the summit; apex very slightly elevated above the truncation. Whirls four, the surface smooth, with minute revolving lines crossed by others equally minute. Body whirl with an acute shoulder, the edge being slightly turned over. Aperture as long as the shell, narrow above, dilated beneath, and broadly rounded. Outer lip acute, thin and reflected over the enlarged umbilicus. Color light amber. Length 0.2 inch.

Fig. 197.

Physa planorbula.

This singular shell was found by Mr. G. B. Clendining at the Cohoes Falls, adhering to stones. I have adopted the name proposed by its discoverer. It was alive, and was destitute of an opercule. It is supposed by some conchologists to be a young *Planorbis*, but I cannot learn that it has been found in the intermediate stages. It is placed provisionally here; but if a perfect animal, must constitute a new genus. I am inclined to suspect that it is the animal described by Say as *Bulla fluviatilis*. (*DeKay.*)

Planorbis megastoma, DEKAY.—Shell large, coarse and solid. Whirls nearly five, rounded, with coarse transverse waving wrinkles, becoming larger towards the mouth. A large prominence on the body whirl nearly opposite to the aperture, producing an obtuse angle. Spire depressed, with the suture distinct; beneath, the volutions are exhibited nearly to the apex. Mouth dilated, but somewhat contracted at the margin, 0.3 inch wide and 0.4 high; its lower portion rounded, arising from the lower part of the penultimate whirl; line of the upper margin more nearly straight. In the young, the aperture is not so much dilated, and is obscurely trigonal, with the lower margin beneath the plane of the transverse diameter of the shell. Color olivaceous, tinged with yellowish within the aperture. In the young, black, with the interior of the aperture dull reddish. Diameter 0.8, height 0.3 inch.

Fig. 198.

Planorbis megastoma.

This *Planorbis* was found near Lake Ontario, and appears to be different from any species yet described. In its aperture it resembles the small *P. dilatatus* of Gould, but is otherwise very distinct. (*DeKay.*)

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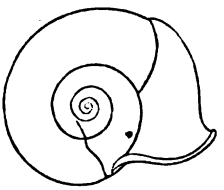
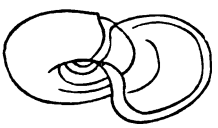
Planorbis macrostomus.—Shell in many points closely resembling *Pl lentus*, Say, of which perhaps it may only be a variety. It is much larger, higher, and has deeper costæ; its lines of growth are very prominently marked; the upper angle of the whirls, as shown in the mouth, is more prominent. Lip widely expanded, and reflected, covered with a white enamel. In this latter character it differs from all the American species of *Planorbis*. It is a species nearly allied to *Planorbis lentus* and *P. trivolvis;* but apparently distinct from both. (*Whiteaves.*)

Fig. 199.





Planorbis macrostomus.

I am inclined to believe *Pl. proboscideus* to be identical with *Pl. trivolvis*. The figure of Potiez & Michaud, copied below, represents a more flattened shell than usually found in *trivolvis*, and the whirls are more numerous. The original description also is given below.

Planorbis proboscideus (MKE., teste ZIEGLER). —This shell has a slight resemblance in form to a young *Pl. corneus*, but it has strong longitudinal striæ; the six whirls are carinated towards the two umbilici, and rounded at the periphery; the upper umbilicus is deep, as well as the lower, which is also large; the aperture is subtrigonal and irregular, which is caused by a depression below. Diam. 20 mill., height 10 mill.

North America in Ohio. (*Potiez & Michaud.*)

Fig. 200.

Planorbis proboscideus.

A copy of Prof. Haldeman's description and figure of *Pl. trivolvis*, var. *fallax*, now follow.

Planorbis trivolvis, var. *fallax.*—*Animal* dark brown, minutely dotted with ochre-yellow, upon the parts which are usually exposed; tentacles very long, colored like the body, except that the tint is somewhat lighter near the base; foot posterior to the neck, about equal in length to the head in front of the tentacles.

Shell thin in texture, translucent, and transversely striate; two and a half turns are visible above, the remaining ones disappearing in the narrow umbilic; lower side carinated, having a wide, shallow cup, as

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in figure 9, when the left posterior angle of the aperture advances along the carina; but the symmetry of the cup disappears, when the inner portion of the last whirl revolves to the right of the carina, as in figure 3; in this case, the right margin of the aperture is nearly level with this side of the shell, but it is frequently thrown below, or to the left of it, when it bears some resemblance to figure 5: aperture slightly compressed anteriorly, the left margin extending beyond the plane of the shell. Color light brown, sometimes greenish.

Fig. 201.

Planorbis trivolvis, var. *fallax*.

Massachusetts, Lake Erie, Indiana?

Monstrosity: Posterior extremity of the foot divided.

In color and consistency, the ova resemble those of *P. bicarinatus*. Dr. Gould has expressed an opinion, that if this be not *P. lentus*, it must be an uncharacterized species. He remarks that it is "a darker shell than *P. trivolvis*, and is distinguished from it by its left side and its aperture. The cup of the left side is less smooth and regular, and is not bounded by the sharp, elevated line; when this shell is laid upon its right or upper side, the lip of that side will scarcely touch the plane on which it lies; while, in *P. trivolvis*, the shell would be lifted by the lip; the aperture has not the sharp angle of the left side produced by the termination of the carina, but in the young stages it is difficult to distinguish the two."

Professor Adams remarks that "*P. lentus*, *P. corpulentus*, and *P. trivolvis*, of Say, are undoubtedly varieties of one species;" but he sent me large specimens of *P. trivolvis* (pl. 2, fig. 6) as *P. corpulentus*; and believed the shell now under consideration to belong to *P. lentus*. I have figured it upon the same plate with the latter, to afford a ready comparison between them; and have thought best to describe it at large, under a distinct heading. I have seen it living in the vicinity of Boston, but have examined so small a number of individuals, that I do not feel myself competent to make a final decision between two authors whose location gives them facilities which I do not enjoy. (*Haldeman.*)

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8115	14	Pacific Coast.	.....	.....
3253	5	San Diego, Cal.	P. R. R.	.....
8124	9	Mohawk, N. Y.	Dr. J. Lewis.	Local var.
8125	15	Yellowstone River.	.....	.....
8126	9	St. Clair River.	.....	Strongly ribbed.
8127	17	Newport, R. I.	W. G. Binney.	.....
8128	15	Utah.	Capt. J. H. Simpson.	.....
8129	3	Madison, Wis.	Prof. S. F. Baird.	.....
8130	3	Farwell's Mills, 3 mile Creek, Oswego, N. Y.	Dr. J. Lewis?	.....
8131	5	Toledo, O.	T. A. Bossard.	.....
8132	5	Ruby Valley.	Capt. J. H. Simpson.	.....
8133	6	Grand Coteau, La.	.....	.....
8144	16	.....	.....	Young.
8145	3	20 m. w. of Choctaw, Ar.	Lt. A. W. Whipple.	.....
8146	6	Cape Elizabeth, Me.	Dr. J. Lewis.	Local var.?
8147	7	Port Huron, Mich.	Prof. S. F. Baird.	.....
8148	15	Lake Winnipeg. [town.	R. Kennicott.	.....
8149	3	Little R., near Shawnee-	.....	.....
8150	15	Mohawk, N. Y.	Dr. J. Lewis.	.....
8151	1	Between Pike Lake and Fort Union.	Gov. J. J. Stevens.	.....
8152	2	Rud's Lake, Mich.	.....	.....
8153	6	Goose Island, Mich.	.....	.....
8154	4	Michigan.	W. G. Binney	.....
8155	2	Illinois. [Min.	.....	.....
8156	5	Lake Como, St. Pauls,	S. B.	.....
8157	4	Prairie Lakes, n. Red R.	R. Kennicott.	.....
8158	16	Southern Illinois.	"	.....
8159	5	Grindstone Creek.	.....	.....
8160	12	Ruby Valley?	Capt. J. H. Simpson.	..... [Griffith.
8161	2	Delaware River.	W. G. Binney.	Labelled by Dr. R. E.
8162	8	Apple Creek, lat. 47°.	.....	.....
8163	7	New York.	Dr. J. Lewis.	.....
8164	1	Big Sioux.	.....	.....
8165	25	Columbus, Ohio.	Dr. J. Lewis.	.....
3523	2	30 m. w. of Ft. Kearney.	.....	.....
8166	2	Centre County, Pa.	.....	.....
8167	9	.....	.....	Young.
8168	4	Milwaukee Wis.	I. A. Lapham.	"
8169	9	Marietta, O.	W. Holden.	.....
8170	4	Milwaukee, Wis.	I. A. Lapham.	.....
8171	3	Texas.	.....	.....
8200	5	Milwaukee, Wis.	I. A. Lapham.	.....
8448	12	Chilleneynck Depot, Puget Sound.	A. Campbell.	Animal in alcohol.
8475	3	Madison, Wis.	Prof. Baird.	Cabinet series.
4399	6	Pacific Coast.	.....	"
4426	8	San Francisco.	.....	"
8731	5	"	Rowell.	.....
8952	1	Fort Simpson, Br. Am.	R. Kennicott.	.....
8173	8	Fort Union.	.....	Var. *fallax*.
8505	2	.....	W. G. Binney.	" Cab. ser.
8971	..	Fort Resolution.	Kennicott.	.....
9062	100+	Grand Rapids, Mich.	Dr. J. Lewis.	.....
9064	50+	Hudson's Bay.	Drexler.	.....
9069	20+	Fort Simpson.	Kennicott.	.....
9110	20+	Mohawk, N. Y.	Dr. Lewis.	.....
9112	50+	"	"	.....
9115	3	Fort Vancouver.	Cooper.	.....
9120	1	California.	"	.....
9272	10	Isle la Crosse.	Kennicott.	.....
9275	5	Great Slave Lake.	"	.....
9257	50+	Massachusetts.	Stimpson.	.....
9259	6	Wright's Lake, Cal.	Newberry.	.....

Planorbis truncatus, MILES.—Shell suborbicular, color light chestnut; the right side deeply umbilicated, the concavity bordered by an obtuse carina; the volutions seen from this side are scarcely more than

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two; left side truncated, presenting a flat surface extending across all the whirls, the suture being marked by a minute raised line, which likewise extends around the edge of the truncation; the space between the volutions of this raised line, as well as the entire body of the shell, is beautifully marked with delicate longitudinal lines, which are crossed by the minute, raised, transverse lines of growth; whirls on left side four or five; aperture ovate, widest on the right side, which extends beyond the general plane of that side of the shell; the lip on the left side is straight for a short distance from the body whirl, and to a line with the truncated plane, at the outer edge of which it forms an angle, marked on the inner surface by a slight groove, corresponding in the raised line separating the whirls on the outside; lip thin, slightly thickened by a bluish white callus, bordered on the inner edge by a purplish band; the longitudinal lines, as well as the transverse lines of growth, are distinctly seen within the aperture. Measurements, 6—35.

Fig. 202.

Planorbis truncatus.

Hab. Saginaw Bay.

In a few specimens the growth of the whirls has not been in the same plane, leaving a slightly projecting turreted spire on the left side. (*Miles.*)

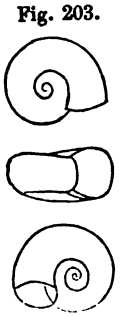
Planorbis truncatus, MILES in Winchel's Geol. Surv. Michigan, 1861, p. 238.

Fig. 202 is drawn from No. 9010 of the collection, furnished by Prof. Miles, whose description is given above.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9010	1	Michigan.	Prof. Miles.	Fig. 202. Type.

Planorbis fragilis, DUNKER.—Shell tumid, fragile, very delicately striate, pale horn or amber colored; deeply umbilicate above, below rather concave; whirls four, involute, on each side rounded, rapidly increasing; the upper ones spirally striated and decussated, conspicuous below; aperture large, spreading, oblique, kidney-shaped; lip very acute, with a very delicate, white callus on the parietal wall.

Fig. 203.



Planorbis fragilis.

Shell very ventricose, very thin and fragile, delicately striated, pale horn or amber colored; above very deeply umbilicated, with the apex hardly visible; below, slightly concave. Whirls four, rounded, strongly involute and rapidly increasing, the last with microscopic striæ; aperture oblique, wide, kidney-shaped; on the parietal wall is a delicate callus connecting the termini of the peritreme. Greatest diam. .6, height at aperture 3⅓ lines.

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Hab. Near Mexico, with *P. tenuis*, which is, however, a rarer species: David & Herr Geb. M. R. Dr. N. Meyer. (*Küster.*)

Planorbis fragilis, DUNKER in CH. ed. 2, p. 46, pl. viii, f. 41–43.

I have given above a copy of the description and figure of this species.

Planorbis lautus, H. ADAMS.—Shell subovate, thin, the height equalling the width, yellowish-white, deeply and narrowly umbilicated above, flat below; whirls three, rapidly increasing, rounded, angulated and contracted above, carinated below, decussated by fine striæ; aperture slightly oblique, subovate, extending above the penultimate whirl, peritreme continuous. Diam. 2 lin.

Hab. New Orleans. (*H. Adams.*)

Planorbis (*Helisoma*) *lautus*, H. ADAMS, Proc. Zool. Soc. London, 1861, p. 145.

I have not seen this species, of which the original description is given above.

Planorbis bicarinatus, SAY.—Shell sinistral, pale yellow or brownish, subcarinate above, and beneath translucent. Spire retus-umbilicate, forming a cavity as deep as that of the base. Aperture large, embracing a considerable portion of the body whirl, and much vaulted above. Within red brown, with two white lines corresponding with the carina. Whirls three, wrinkled and with minute revolving lines. Length one-fourth of an inch, breadth nearly half an inch.

Fig. 204.

Planorbis bicarinatus.

Fig. 205.

Planorbis bicarinatus.

Inhabitant aquatic, ferruginous, with numerous yellowish dots; tentacula dotted and flexuous. Pl. 1, fig. 4. Resembles the preceding species in its outline, but differs from that shell in the remarkable appearance of its spire; it is also destitute of those fine parallel raised lines, and is furnished with minute striæ, never visible in *P. trivolvis:* the superior part of the lip is more vaulted, and the carina more visible. (*Say.*)

Planorbis bicarinatus, SAY, Nich. Ency. pl. i, f. 4 (1817, 1818, 1819); Am. Conch. 6, pl. liv, f. 3 (1834): BINNEY'S ed. 44, pl. liv, f. 3; pl. lxix, f. 4.—MRS. GRAY, Fig. Moll. An. pl. cccx, f. 1.—HALDEMAN, Mon. vii, p. 6, pl. i, f. 1–6 (1844).—ADAMS, Shells of Vt. 155 (1842).—DEKAY, N. Y. Moll. 60, pl. iv, f. 63 (1843).—GOULD, Inv. of Mass. 203, f. 134 (1841).—CHEMN. ed. 2, p. 56, pl. lx, f. 11–13.—POTIEZ et MICHAUD, Gal. des Moll. I, 207, pl. xxi, f. 1–3.—ANON. Can. Nat. II, 204, fig. (1857).

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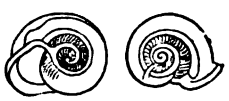
Helix angulata, RACKETT, Lin. Tr. XIII, p. 42, pl. v, f. 1 (1822).—WOOD, Cat. Suppl. pl. vii, f. 12: HANLEY's ed. p. 226.
Helix bicarinatus, EATON, Zool. Text-Book, 194 (1826).
Planorbis engonatus, CONRAD, N. Fresh Sh. Suppl. p. 8, pl. ix, f. 8 (1834). —LISTER, 139–44?

The species ranges from the British Possessions to Kansas and Georgia.

It must not be confounded with *Planorbis bicarinatus* of Lamarck, An. sans Vert. vol. 7, Aug. 1822.

Fig. 204 is a fac-simile of that of Say, and Figs. 206 and 207 of those of Rackett and Conrad. Haldeman, who saw the original specimen of the latter declares it to be a monstrosity of *Plan. bicarinatus*. The original descriptions are also given below.

Fig. 206.



Helix angulata.

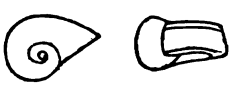
Helix angulata, RACKETT (*l. c.*).—Shell imperforate, concave on both sides; first whirl angulated on both sides.

Hab. Near Lake Huron. Diam. ½ inch.

Transversely striate, pale yellow; three to four contiguous whirls; aperture large, rimmed. (*Rackett.*)

Planorbis engonatus, CONRAD.—Shell yellowish, triangulated above, spire not profoundly impressed, side of the body whirl flattened, and both margins carinated; aperture longitudinally subovate, slightly campanulate.

Fig. 207.



Planorbis engonatus.

This species was found at Albany, N. Y., by Mr. Alva Mason. It differs from all other species of the United States in the flattened form of its lateral or outer margin. (*Conrad.*)

Planorbis bicarinatus of Sowerby's Genera of Shells appears rather to be identical with *Pl. campanulatus*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8212	20	Cherry Creek.	.....	.....
8213	15	Mohawk River, N. Y.	Dr. J. Lewis.	.....
8214	11	Northern Georgia.	A. Gerhardt.	.....
8215	5	Milwaukee, Wis.	I. A. Lapham.	.....
8216	11	Big Sioux.	.....	.....
8217	4	Yellowstone.	.....	.....
8218	10	Little Lakes, N. Y.	Dr. J. Lewis.	.....
8219	3	Herkimer County, N. Y.	"	.....
8220	5	Big Cr., Centre Co., Pa.	.....	.....
8221	6	New York?	Dr. J. Lewis.	.....
8222	2	Illinois.	.....	.....
8493	3	New York.	Dr. J. Lewis.	Cabinet series.
9111	50+	Mohawk, N. Y.	"	.....
9113	50+	"	"	.....
9262	15	Virginia.	Dr. English.	.....

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Planorbis antrosus, CONRAD.—Shell dextral, not depressed; whirls three; spire profoundly indented or concave, with the summit of the body whirl angular; inner volutions angulated, umbilicus profound, with the margin and inner volutions angulated; body whirl abruptly dilated near the aperture; aperture longitudinally subovate, dilated.

Randon's Creek, near Claiborne, Alabama, adhering to limestone rocks. (*Conrad.*)

Planorbis antrosus, CONRAD, Am. Journ. Sc. [1], XXV, No. 2, p. 343 (1834). —DEKAY, N. Y. Moll. 66 (1843).—MÜLLER, Syn. Test. 1834 prom. p. 34 (1836).

I have seen no authentic specimen of this shell.

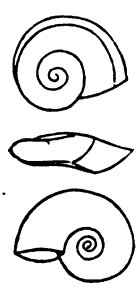
SUBGENUS **MENETUS**, H. & A. AD.

Shell depressed; whirls rapidly increasing, periphery angulated.

Moquin-Tandon uses *Hippeutis* of Agassiz instead of *Menetus* as a name for this section. I do not have access to the description of *Hippeutis*, and therefore follow H. & A. Adams in using *Menetus*.

Planorbis opercularis, GOULD.—Shell small, dextral, much depressed, lenticular, with a prominent blunted keel at the periphery defined by a marginal, compressed line; tip sunken; beneath umbilicated for about one-third the breadth of the base, showing three volutions, convex, surface rather rude and indented, marked with irregular, coarse, much arcuated lines of growth, and here and there a few obscure, raised, revolving lines; color dark chestnut-brown, a little clouded; whirls above four, slightly convex; suture well defined, impressed; aperture transversely sub-rhombic, lip above slightly declining, at periphery acute-angled, beneath arched, lips embracing three-fourths of that part of the whirl which is beneath the carina. Length one-fourth, diam. one-sixteenth inch.

Fig. 208.



Planorbis opercularis.

Sacramento River, California.

Allied to *Pl. exacutus*, but is larger, less compressed and less delicate, and the periphery instead of being sharp-edged, has a blunted keel like *Pl. carinatus*. (*Gould.*)

Planorbis opercularis, GOULD, Proc. Bost. Soc. Nat. Hist. II, 212 (1847); U. S. Ex. Ex. Moll. 113, f. 132, 132 *a*, 132 *b* (1852); Otia, 42.

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Planorbis planulatus, COOPER, Report on the Nat. Hist., &c., of Washington Terr., &c., p. 378 (1859); P. R. R. Rep. XII, 378.

Dr. Gould's description and figures are given above. There can be no doubt of the identity of Cooper's species with it. The Fig. 209 is drawn from a shell furnished by Judge Cooper, who also has enabled me to examine all the shells collected by Dr. Cooper.

Fig. 209.

Planorbis planulatus.

Planorbis planulatus, COOPER.—A small carinated species, flat above, convex below, having much the appearance of a *Valvata*, found only in Lakes on Whidby's Island at the entrance of Puget Sound. (*Cooper.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
4280	4	San Francisco.	Com. Wilkes.	Cabinet series.
8718	4	"	Rowell.	[(*planulatus*).
9118	3	Whidby's Island.	Judge Cooper.	Type. Fig. 209

Planorbis exacutus, SAY.—Dextral, depressed, with an acute edge. Inhabits Lake Champlain. Cabinet of the Academy.

Shell depressed; whirls four, striated across, wider than long, not elevated above the suture, but a little flattened, sides obliquely descending to an acute lateral edge, below the middle; spire not impressed; suture not profoundly indented; beneath, body whirl flattened, on the inner edge rounded; umbilicus regular, exhibiting all the volutions to the apex; aperture transversely sub-triangular; labrum angulated in the middle, arcuated near its inferior tip, the superior termination just including the acute edge of the penultimate whirl. Greatest breadth rather less than ¼ of an inch.

Fig. 210.

Planorbis exacutus.

This species was found in Lake Champlain by Mr. Augustus Jessup, who deposited it in the collection of the Academy. Only two specimens occurred. It may be readily distinguished from *P. parvus*, by its more convex form above, the spire not being impressed, and by its very acute lateral edge. It appears to be pretty closely allied to *Planorbis nitidus* of Europe, but it is larger, the umbilicus much more dilated, and the aperture does not embrace the penultimate whirl so profoundly. (*Say.*)

Planorbis exacutus, SAY, Jour. Acad. Nat. Sc. II, 165 (1821): BINNEY'S ed. 64.—HALDEMAN, Mon. 21, pl. iv, f. 1-3 (1844).—GOULD, Inv. of Mass. 208, f. 137 (1841).—ADAMS, Shells of Vt. 155 (1842).—DEKAY, N. Y. Moll. 63, pl. lv, f. 62 *a*, *b* (1843).—ANON. Can. Nat. II, 207, fig. (1857).

Planorbis lens, LEA, Tr. Am. Phil. Soc. VI, 68, pl. xxiii, f. 83; Obs. II, 68 (1839).

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Planorbis brogniartiana, LEA, Tr. Am. Phil. Soc. IX, 24; Obs. IV, 24 (1844); Pr. II, 242 (1842).

Planorbis lenticularis, LEA, Tr. Am. Phil. Soc. IX, 6; Obs. IV, 6 (1844).

Planorbis buchanensis, LEA, Tr. Am. Phil. Soc. IX, 6 (1844); Pr. II, 32 (1841); Obs. IV, 6.

Paludina hyalina, LEA, Tr. Am. Phil. Soc. VI, 17, pl. xxiii, f. 81; Obs. II, 17 (1839).

The species has been quoted from New England to Kansas and the District of Columbia.

The single individual from which Mr. Lea drew his description of *Paludina hyalina* has been lost. I have not seen it. The following copy of the original description and figure will at once convince the reader of its being a distorted specimen of *Planorbis exacutus*.

Paludina hyalina, LEA.—Shell obtusely conical, carinate, diaphanous, flattened below; whirls four; sutures very much impressed; aperture widely rounded. Diam. .2, length .2 inch nearly.

Near Poland, Ohio: Dr. Kirtland. Cabinet of Mr. Hyde.

Fig. 211.

Paludina hyalina.

Dr. Kirtland sent the only specimen of this shell I have seen to Mr. Hyde, under the impression that it was a deformed specimen of *Planorbis*. Mr. Hyde communicated it to me as a new species, of which there cannot, I think, be a doubt. It is very remarkable for the flatness of the inferior portion of the last whirl, and for the carina on the periphery which this causes. It is perhaps thinner and more transparent than any species yet described. (*Lea.*)

Planorbis buchanensis, Lea, is evidently synonymous with *P. exacutus*. The original description and figures from Mr. Lea's type now follow:—

Planorbis buchanensis, LEA.—Shell sub-lenticular, above sub-convex, carinate at the periphery, beneath narrow umbilicate, horn-color or brownish, smooth; whirls three · lip sharp; aperture rounded.

Fig. 212.

Planorbis buchanensis.

Hab. Near Cincinnati, Ohio: R. Buchanan. My cabinet, and cabinets of T. G. Lea and R. Buchanan. Diam. .12, length .08 of an inch.

Several specimens of this species were sent to me several years since by my brother T. G. Lea, who informed me that they were first observed by Mr. Buchanan, after whom I name it. This species is very nearly allied to *P. lens*, Nobis, but it may at once be distinguished by its round aperture, which is somewhat spread out. The aperture of the *lens* (now *lenticularis*), is *triangular*, and the size of the shell rather larger. (*Lea.*)

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Planorbis lens is referred doubtfully to *exacutus* by DeKay. Gould refers it to *P. dilatatus*. I have no hesitation in placing it in the synonymy of *Pl. exacutus*. No. 8508 of the collection was labelled *P. lens* by Mr. Lea. A copy of his description and figure here follow. The names *P. lenticularis* and *P. brogniartiana* were suggested by Mr. Lea in place of the pre-occupied name first published by him.

Planorbis lens, LEA.—Shell small, lenticular, widely umbilicate, carinate on the periphery, pellucid, horn-colored; whirls three; aperture large.

Fig. 213.

Planorbis lens.

Hab. Near Cincinnati, Ohio: R. Buchanan. My cabinet, and cabinets of R. Buchanan and T. G. Lea. Diam. 3-20ths, length 1-20th of an inch.

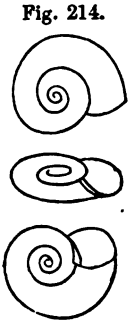
This is the smallest of the *Planorbes* which has come under my notice, and may at once be distinguished by its lenticular form. The specimens in my possession I owe to my brother T. G. Lea. They were first pointed out to him by Mr. Buchanan. (*Lea.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8203	2	Ohio.	S. M. Luther.	.....
8209	12	Marietta, Ohio.	W. Holden.	.....
8210	2	Milwaukee, Wis.	I. A. Lapham.	.....
8211	10	Ann Arbor, Mich.	W. G. Binney.	.....
8494	2	.....	"	Cabinet series. [Lea.
8508	3	Yellowstone River.	Dr. F. V. Hayden.	Marked *Pl. lens* by I.
9252	1	.....	.....	(*lens*, teste Lea.)

SUBGENUS **GYRAULUS**, AGASSIZ.

Shell orbicular above, flat beneath; whirls few, rapidly increasing.

Fig. 214.



Planorbis vermicularis.

H. & A. Adams use *Nautilina*, Stein, as a name for this section, but Moquin-Tandon uses Agassiz' name. I am unable to decide which should have preference.

Planorbis vermicularis, GOULD.—Shell small, dome-shaped, minutely striated by growth, white (probably bleached by the liquor from which it was taken); whirls four, breadth and height about equal, the last one deflected near the aperture, rounded at periphery, tip depressed, suture very deep, the whirls sloping towards it; base cup-shaped, exhibiting all the whirls. Aperture exhibiting a very oblique section of a cylinder; lip

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embracing about one-half the height of the last whirl and joined by callus. Diam. one-fifth, height one-fifteenth inch.

Interior of Oregon: Drayton.

It is about the size of *Plan. deflectus*, Say, but is less depressed, the whirls more cylindrical, not carinated at periphery. (*Gould.*)

Planorbis vermicularis, GOULD, Proc. Bost. Soc. Nat. Hist. II, 212 (1847); U. S. Ex. Ex. Moll. p. 112, f. 131, 131 *a*, 131 *b* (1852); Otia, 42.

I have seen no specimens of this species. The original descriptions and figures are given above.

Planorbis deflectus, SAY. — Shell dextral, depressed; whirls nearly five, minutely and regularly wrinkled across, wider than long with a much depressed rotundity above, descending to an acute lateral edge below the middle; spire not impressed; suture indented, but not profoundly; beneath a little concave in the middle, exhibiting one-half of each volution to the apex; whirls flattened, slightly rounded; aperture declining very much, suboval, the superior portion of the labrum considerably surpassing the inferior portion, and taking its origin a little above the carina; inferior portion of the labrum terminating on the middle of the inferior surface of the penultimate whirl. Greatest breadth two-fifths of an inch.

Fig. 215.

Planorbis deflectus.

This shell was presented to me by Dr. Bigsby, who collected many specimens in the waters of the Northwest Territory. It resembles the *exacutus*, Nob., but the aperture does not embrace so large a portion of the preceding volution, and the volutions on the inferior portions of the shell are consequently more obvious and the umbilicus is but slightly indented; the upper portion of the labrum does not extend so far beyond the lower portion, the aperture declines much more, and the carina is less acute. It has also an affinity for the *carinatus* of Europe, but in addition to other differences, the aperture of that species declines but little, if at all, and the carina is an elevated revolving line. The aperture embraces the penultimate volution about as much as in the *rotundatus* of Europe, to which our shell is also allied, but differs in its declining aperture, and the less degree of rotundity of its whirls on their upper surface. (*Say.*)

Planorbis deflectus, SAY, Long's Ex. II, 261, pl. xv, f. 8 (1824): BINNEY'S ed. p. 128, pl. lxxiv, f. 8.—HALDEMAN, Mon. 25, pl. iv, f. 4–7 (1844).—GOULD, Invert. 207, f. 136 (1841).—ADAMS, Shells of Vt. 156 (1842).—DEKAY, N. Y. Moll. 65 (1843).—ANON. Can. Nat. II, 206, fig. (1857).

Planorbis virens, ADAMS, Am. Journ. Sc. [1], XXXIX, p. 274 (1840); Bost. Journ. III, 326, pl. iii, f. 15 (1840).—DEKAY, N. Y. Moll, 66 (1843).

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Planorbis obliquus, DeKay, N. Y. Moll. 62, pl. iv, f. 57 *a*, *b* (1843).
Nautilina deflecta, Chenu, Man. de Conch. II, 482, f. 3566.

This species is said to range from great Slave Lake to the District of Columbia, and from New England to Nebraska.

Mr. Say's type is still preserved in the Philadelphia Academy.

I am inclined to place *P. obliquus* in the synonymy of *P. deflectus*. *Pl. virens* is so considered by both Gould and Haldeman. Copies of the original descriptions and figures here follow:—

Planorbis virens.—Shell small, greenish horn-color, with thick, obvious striæ of growth, and very slight revolving lines, with a green rough epidermis; whirls four; suture impressed; spire not rising above the last whirl, but scarcely falling below it; last whirl much larger than the spire, flattened above, then abruptly curving downwards (in the young shell, at the upper third of the last whirl, is a carina, which is gradually modified into the abrupt curvature, in the progress of growth), subcarinate below, as are also the preceding whirls; aperture nearly orbicular, interrupted by the last whirl in about one-fifth of its circumference, advancing above; umbilicus as broad as the last whirl, rather deep, exhibiting all the volutions. Height (of the last whirl) .09 inch, greatest breadth .23 inch, least breadth .18 inch. Cabinets of the Bost. Soc. Nat. Hist., of Middlebury College, of Mr. Shiverick, and my own.

Fig. 216.

Planorbis virens.

Habitat. New Bedford.

For this species I am indebted to Mr. Shiverick. It differs from *P. parvus*, Say, in being much less broadly and more deeply umbilicate beneath; it is also higher. *P. parvus*, also, instead of being subcarinate on the lower side of the whirls is much flattened. *P. concavus*, Anthony MSS., resembles this species, but is more regularly convex above and concave beneath. (*Adams.*)

Planorbis obliquus, DeKay.—Shell depressed, discoidal. Volutions four; the surface shining, with regular minute incremental lines; the body whirl obsoletely subangular below. Spire nearly as much depressed as the umbilicus, which latter is large and exhibits all the volutions to the apex; suture distinct; body whirl not distinctly deflected from the plane of the other volutions. Mouth unarmed, very oblique. Color dull olive. Diameter 0.3, Leight 0.1.

Fig. 217.

Planorbis obliquus.

The specimens of this species were obtained from the Mohawk and from Newcomb's Pond, in Pittstown, and presented by Dr. B. W. Budd, of this city. Some eminent conchologists suppose it to be a variety of the *deflectus* of Say; but from this it differs by the obliquity of the mouth when turned downwards, and has no acute lateral edge as in that species. The *concavus* of Anthony, of which I have seen

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specimens, but no description, may possibly be the young of this, but at all events is a closely allied species. (*DeKay.*)

Planorbis deformis, Lam., figured in Delessert's Recueil, very much resembles this species in the characteristic deflection of the last whirl at the aperture.

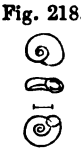
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8190	19	Milwaukee, Wis.	I. A. Lapham.	.....
8191	14	Loup Fork.	.....	.....
8192	1	Lake of the Woods.	R. Kennicott.	.....
8193	12	Washington, D. C.	.....	.....
8194	3	Ann Arbor, Mich.	.....	.....
8501	5	Wisconsin.	I. A. Lapham.	Cabinet series.
9273	8	Great Slave Lake.	R. Kennicott.	.....

Planorbis dilatatus, Gould.—Shell small, circumference carinated, flat above, convex below, and with a small, deep umbilicus; whirls three; aperture large, expanded.

State Coll. No. 75, Soc. Cab. No. 2399.

Shell small, of a yellowish-green color, minutely wrinkled by the lines of growth; spire flat, composed of not more than three whirls, separated by a well-defined suture; the outer whirl has a sharp margin on a level with the spire, diminishing near, but still modifying, the aperture; below this line, the whirl is very convexly rounded so as to encircle a small, deep, abruptly formed umbilicus. This whirl rapidly enlarges, and terminates in a very large, not very oblique aperture, with the lip expanded so as to make it trumpet-shaped. Largest diameter three-twentieths inch, breadth one-twentieth inch.

Fig. 218.



Planorbis dilatatus.

This curious little shell was found several years since on the Island of Nantucket, clinging to some damp moss, and was communicated by Mr. J. M. Earle, of Worcester. Specimens of it have also been sent to me by Professor Foreman, of Baltimore. But its characters were not fully ascertained from these few specimens. In July, 1840, Mr. T. J. Whittemore found it in great numbers at Hingham, in a small pool, southeast of the Old Colony House.

It has a miniature resemblance to *P. bicarinatus*, as to its two sides, but it has only a single carina, which encircles the shell, instead of one on each side. Its large, expanded aperture, and small, deeply sunken umbilicus, readily distinguish it from any of the small species hitherto known. The surface is rather rough, and perhaps a little hispid when viewed under the microscope. The *P. lens* of Lea (Amer. Philos. Trans., New Series, VI, 68, pl. xxiii, f. 83), which he received from near Cincinnati, is probably the same as this shell. His name, however, is pre-occupied by a fossil species. (*Gould.*)

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Planorbis dilatatus, GOULD, Invert. of Mass. 210, f. 140 (1841); Otia, 182. —HALDEMAN, Mon. 23, pl. iv, f. 16–18 (1844).—DEKAY, N. Y. Moll. 66 (1843).—ANONYMOUS, Can. Nat. II, 209, fig. (1857).
Planorbis dilatus, HALDEMAN, Mon. p. 25 (Jan. 1844).

Fig. 218 is a fac-simile of Gould's figures; his description is copied above.

Dr. Pfeiffer (Arch. f. Nat. 1841, p. 225) has described an European species under the same name, and in the same year (1841) as Dr. Gould's species was published. The latter appeared during the session of the Legislature in the spring. Prof. Haldeman (*l. c.*) suggests the name "*dilatus*," should it be necessary to give a new name to our shell.

Gould (*l. c.*) refers to this species *Pl. lens*, Lea.

It has been noticed from New England to Maryland.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8510	1	Massachusetts.	W. G. Binney.	Cabinet series.

Planorbis albus, MÜLL.—Shell light yellowish-brown, concave on both sides, most so on the left; whirls three; surface beset with revolving lines of rigid hairs; aperture large, very oblique.

Fig. 219.

Planorbis albus.

Fig. 220.

Planorbis albus.

State Coll. No. 82, Soc. Cab. No. 1278.

Fig. 221.

Planorbis albus.

Shell small, somewhat transparent, of a brownish-yellow color; both sides concave, the left rather more than the right, but the concavity is there more limited by the presence of a sub-angular ridge on the outer whirl; whirls three, the outer one rapidly increasing; surface exhibiting traces of revolving lines when denuded, but usually covered with a dark pigment or epidermis, bristling with rigid hairs which are arranged in close revolving lines; lines of growth very faint; aperture sub-oval, oblique, its diameter from side to side shorter than in the opposite direction; its plane very oblique. Long diameter one-fifth inch, short diameter one-fifteenth inch. Animal has the head slate-colored above, with a darker line along each tentaculum, not originating from the eyes; foot chestnut colored.

This shell was first found by Professor C. B. Adams, in Mansfield, from whom I received it. I have since found it in several localities in Dorchester, Dedham, and Cambridge, adhering to sticks in stagnant water; and it may doubtless be found in all similar localities.

This *Planorbis*, though in many respects it resembles in shape *P. deflec-*

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tus, is readily distinguished from all other American species by the revolving hairy lines. It is the analogue of the European *P. albus*, from which it is difficult to designate any very characteristic difference. It is, however, a thinner shell, the last whirl increasing more rapidly; and it maintains its yellowish-horn-color, whereas *P. albus* assumes a spermaceti or still whiter appearance. The lines, too, disappear more entirely when the epidermis is gone. (*Gould.—P. hirsutus.*)

Planorbis albus, MÜLLER, HALDEMAN, Mon. 29, pl. iv, f. 8–10 (1844).

Planorbis hirsutus, GOULD, Am. Journ. Sc. [1], XXXVIII, 196 (1840); Invert. of Mass. 206, f. 135 (1841); Otia, 180.—ADAMS, Shells of Vt. 156 (1842).—DEKAY, N. Y. Moll. 64 (1843).—ANONYMOUS, Can. Nat. II, 206, fig. (1857).

Said to have been found from New England to the Saskatchewan, and in the District of Columbia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8511	2	.....	W. G. Binney.	Cabinet series.

Planorbis parvus, SAY.—Shell horn-color or blackish; whirls four, crossed by minute wrinkles; concave above and beneath, and equally exhibiting the volutions, body generally subcarinate on the margin; lip rounded, and not vaulted above nor thickened; mouth within bluish-white. Breadth one-fifth of an inch.

Fig. 222.

Planorbis parvus.

Fig. 223.

Planorbis parvus.

Animal aquatic, brown, tentacula long, filiform, whitish, with a darker central line; tail rounded. Probably the same species with that figured by Lister, tab. 139, fig. 45; it is very numerous in the Delaware, in company with the two preceding shells. (*Say.*)

Fig. 224.

Planorbis parvus.

Planorbis parvus, SAY, Nich. Ency. pl. i, f. 5 (1817, 1818, 1819): BINNEY's ed. p. 45, pl. lxix, f. 5.—HALDEMAN, Mon. 27, pl. iv, f. 19–23 (1844).—GOULD, Invert. 209, f. 139 (1841).—ADAMS, Shells of Vt. 156 (1842).—DEKAY, N. Y. Moll. 63, pl. iv, f. 58 (1843).—ANON. Can. Nat. II, 208, fig. (1857).

Planorbis concavus, ANTHONY, Cat. of Shells of Cincinnati, no desc.

Planorbis elevatus, ADAMS, Bost. Journ. Nat. Hist. III, 327, pl. iii, f. 16 (1840).—GOULD, Inv. of Mass. 207 (1841).—DEKAY, N. Y. Moll. 65.

Helix parvus, EATON, Zool. Text-Book, 195 (1826).

Said to inhabit the whole of eastern North America.

Mr. Say's type is still preserved in the Philadelphia Academy's collection.

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Haldeman considers *Pl. elevatus* a synonym of this species. No. 8509 of the collection was labelled by J. G. Anthony *Pl. concavus*, a name occurring in catalogues, but not described. I have no doubt of its identity with this species. No description was ever published, as Mr. Anthony informs me, owing to the doubts of its being distinct. The original description and figure of *Pl. elevatus* are given below.

Planorbis elevatus.—Shell horn-color, finely striate; whirls four, as high as wide; last whirl well rounded, very distinctly carinate below; inclination to the left about 48°; right side convex, flattened at the apex; left side very deeply concave; suture deeply impressed; aperture round-ovate, large, with its upper extending much beyond its lower margin. Greatest breadth .17 inch, least breadth .13 inch, height .06 inch. Cabinets of Bost. Soc. Nat. Hist., of Middlebury College, of S. S. Haldeman, of Marietta, Pa.; of J. G. Anthony, of Cincinnati, and my own.

Fig. 225.

Planorbis elevatus.

Habitat. This species was discovered in the summer of 1838, in a small spring in a rocky cavity, in South Boston. Nearly a hundred specimens were obtained, and a much larger number were left. Visiting the same spot a few days since (July, 1840), I found the spring filled up with stones to the top of the water, and not a shell to be seen. Last summer I obtained a specimen in Lake George, N. Y. Dr. Wm. Prescott has found the species in Lynn.

This species much resembles *P. parvus*, Say, and for some time I doubted whether it was distinct. But the specimens uniformly differ from that shell in having the spire elevated above the plane of the last whirl, whereas in that species it is concave, and consequently this species is much more deeply umbilicated on the left side; also, that species is distinctly carinate on the middle of the last whirl, but is very indistinctly carinate below the middle, if at all. (*Adams.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8181	1	Ruby Valley.	Capt. J. H. Simpson.	.....
8182	4	Apple Creek.	.....	.....
8183	21	Northern Georgia.	A. Gerhardt.	.....
8184	5	Big Sioux.	.....	.....
8185	34	Maine.	Dr. J. Lewis	.....
8186	7	Marietta, O.	W. Holden.	.....
8187	13	Apple Creek, lat. 47°.	.....	.....
8188	7	Yellowstone River.	.....	.....
8189	70	Mohawk, N. Y.	Dr. J. Lewis.	.....
8303	200	New York.	"	Cabinet series.
9127	5	Moose Factory.	Drexler.	.....
9087	8	Fort Simpson.	Kennicott.	.....
8512	6	Ann Arbor, Mich.	A. Winchell.	(*Pl. elevatus?*)
8509	6	.....	W. G. Binney.	Named *Pl. concavus* [by Anthony.
9295	1	Otter Tail Creek, Min.	Kennicott.	

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Planorbis arcticus, BECK.—Shell dextral, horn-colored, thin, convex and excavated in the centre above, concave below; three and a half cylindrical whirls. Diam. 2, 2‴. (*Möller, l. c.*)

Planorbis arcticus, BECK in MÖLLER, Ind. Moll. Grön. 5.—MÖRCH, Moll. Grön. 76.

I have not been able to obtain any authentic specimen for figuring. The only published description is copied above.

SPURIOUS SPECIES OF PLANORBIS.

Planorbis armigerus and *P. wheatleyi* are *Segmentine.*

Planorbis parallelus, SAY, J. A. N. S. II, 164: BINNEY's ed. p. 63, is *Helix lineata* (q. v.). Authentic specimens among Ferussac's shells in the Garden of Plants are so labelled, as Dr. Gould informs me.

Planorbis niger. I know nothing of this species mentioned as new, with no description, by DEKAY in New York Zoological Report of Dec. 20, 1839, p. 32.

Planorbis complanatus, from Western Lakes, is mentioned by name only by RAVENEL, Cat. of Shells, p. 11. A foreign species has been described under this name.

Planorbis obtusa, LEA, is mentioned by WHEATLEY, Cat. of U. S. Shells, 2d ed., p. 22, without description, giving Ohio as habitat. The name is pre-occupied also.

Planorbis eburneus, CHEMN., is quoted doubtfully as synonym of *Pl. bicarinatus* in BECK's Index, p. 118, as is

Planorbis subcarinatus, SAY (p. 119), of North America, without description, *Physa anceps* of MENKE being doubtfully cited as synonym (LISTER, Hist. CXXXIX, 44): Delaware River; and *subdistortus* as another variety.

Planorbis fovealis, BECK (Ind. 119): Delaware River. No description is given, but reference to LISTER, Hist. cxl, f. 47.

Planorbis capillaris, BECK (Ind. 119): Mexico; and *Planorbis fuliginosus*, BECK (Ind. 120): Mexico. No description.

Planorbis evacuus, VILLA = *P. exacutus*?

Planorbis glans, DEKAY = *Glandina truncata.*

Planorbis alba? SHEPPARD (Trans. Lit. and Hist. Soc. Quebec, I, 195, 1829).—Shell umbilicated on both sides; upper part of whirls flat, lower convex; aperture wide and angular. (Near Quebec.) = *Plan. albus*, MÜLL.?

It is the *Helix alba*, LIN., but is not among Lamarck's species. (*Sheppard.*)

Planorbis spirorbis, SHEPPARD (Trans. of Lit. and Hist. Soc. Quebec, I, 195, 1829).—"One side flat, the other subumbilicate, reverse; horn-colored. (Near Quebec, at Etchemin.)" (*Sheppard.*)

I do not know anything of this species, whether it is the *P. spirorbis* of Europe or not.

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Fossil Species of Planorbis.

Dr. Meek furnishes me with the following list of fossil species:—

Planorbis spectabilis, Meek, Proc. Phila. Ac. 1860, 315.
Planorbis utahensis, Meek, Proc. Phila. Ac. 1860, 314.
Planorbis vitrinus, Meek & Hayden, Proc. Phila. Ac. 1860, 413.
Planorbis nebrascensis, Evans & Shumard, Proc. Phila. Ac. 1854, 154.
Planorbis vetulus, Meek & Hayden, Proc. Phila. Ac. 1860, 175.
Planorbis convolutus, Meek & Hayden, Proc. Phila. Ac. 1856, 120.
Planorbis planoconvex, Meek & Hayden, Proc. Phila. Ac. 1860, 452.
(Olim *fragilis*, Meek & Hayden, Proc. Phila. Ac. 1857, 136, not of Dunker.)
Planorbis subumbilicatus, Meek & Hayden = *Valvata subumbilicata*, q. v.

SEGMENTINA, Fleming.

Tentacles filiform. Foot narrow anteriorly, larger behind.

Shell dextral, discoidal, spire depressed, horn-colored; whirls few, visible on both sides, furnished internally with transverse, testaceous partitions or teeth; aperture transversely oval or circular; outer lip simple.

Jaws (of *S. lacustris*) very narrow, very much arched, flexible, scarcely brown, greatly attenuated, pointed. Vertical striæ or marginal denticulations hardly apparent.

Lingual membrane — ?

There are but few species of *Segmentina*, which are not acknowledged as a separate genus by all authors. The name either as generic or subgeneric is universally adopted, as it has priority of *Hemithalamus*, Leach, *Segmentaria*, Swains., and *Discus*, Hald.

The typical forms are not represented in this country—our two species belonging to the section *Planorbula*.

Subgenus PLANORBULA, Hald.

Shell with the aperture furnished with dentiform plicæ, not forming open partitions.

Segmentina wheatleyi, Lea.—Shell small, dark horn-colored, flat, obsoletely striated, bicarinate, depressed above, broadly and deeply

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umbilicated below; whirls five, obtusely carinated above, below acutely so; aperture white, thick, strongly constricted; within are six teeth.

Fig. 226.

Segmentina wheatleyi.

Fig. 227.

Segmentina wheatleyi.

Cotoma Creek, Montgomery Co., Ala. (*Lea.*)

Planorbis wheatleyi, Lea, Pr. Phila. Acad. Nat. Sc. 1858, p. 41.

I have specimens received from Florida, which, on comparison with Mr. Lea's type, are evidently the same. It is a well-marked species, nearly allied to *Seg. armigera*, but distinguished by its carination, &c., and by the body whirl being continued beyond the thickened, heavy lip, making it "duplicatim continuatum," like that of *Helicina tropica*. The shell figured was given me by Mr. Lea.

Cat. No	No. of Sp.	Locality.	From whom received.	Remarks.
9123	2	Florida.	I. Lea.	Figured.

Segmentina armigera, Say.—Shell dextral, brownish horn-color, wrinkles obsolete; spire perfectly regular, slightly concave; suture well impressed; umbilicus profound, exhibiting the volutions; whirls four, longer than wide, obtusely carinated above, carina obsolete near the aperture, a carina beneath continued to the aperture; aperture longitudinally subovate, oblique; labrum blackish on the edge; throat armed with five teeth, placed two upon the pillar side, of which one is large, prominent, perpendicular, lamelliform, oblique, and rounded abruptly at each extremity; near the anterior tip is a small prominent conic acute one; on the side of the labrum is a prominent lamelliform tooth near the base, and two slightly elevated, oblique, lamelliform ones above. Length ¼ of an inch nearly.

Fig. 228.

Segmentina armigera.

Fig. 229.

Segmentina armigera.

Inhabits Upper Missouri.

Remarkable by the teeth, but these are only discoverable by the microscopical examination of the mouth, and they are situated far within it. (*Say.*)

Planorbis armigerus, Say, Jour. Acad. Nat. Sc. II, 164 (1818): Binney's ed. p. 63.—Haldeman, Mon. 30, pl. iv, f. 11–13 (1844).—Gould, Invert. 205, f. 138 (1841).—Adams, Shells of Vt. 155 (1842).—DeKay, N. Y. Moll. 62, pl. 7v, f. 64 *a*, *b*, *c* (1843).—Mrs. Gray, Fig. Moll. An. cccx, f. 2.—Anony. Can. Nat. II, 205, fig. (1857).

Segmentina armigera, H. & A. Adams, Gen. Rec. Moll. II, 264, pl. lxxxiv, f. 4.

Planorbella armigera, Chenu, Man. de Conch. II, 283, f. 3570.

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Haldeman says "the teeth are present when the shell is a line in length, and as but one set exists in full grown individuals, we must infer that they are absorbed and reproduced from time to time. In overgrown specimens like those figured, it sometimes happens that the teeth are wanting; as if, after their absorption, the energies of the animal were too far exhausted to reproduce them. The outer ones seem to be formed successively from left to right, the small one on the right appearing last, and in its absence, the shell has been described by Say and Gould as being but five-dentate."

Ranges from the Eastern through the Middle, Western, and Northwestern States, and as far north as Peace River.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8196	11	Milwaukee, Wis.	I. A. Lapham.	.....
8197	50	.....	Dr. J. Lewis.	.....
8497	9	New York.	"	Cabinet series.
9116	10	James Bay, B. A.	Drexler.	.....
9070	20	Hudson's Bay.	"	.....
8970	..	Fort Resolution.	Kennicott.	.....
9274	17	Great Slave Lake.	"	.....

Subfamily ANCYLINÆ.

Shell non-spiral, conical, limpet-like.

All the known genera of *Ancylinæ* are represented in North America except *Latia*, which has a spiral shell and a transverse septum in the aperture.

ANCYLUS, Geoffroy.

Fig. 230.

Animal of *Ancylus*.

Tentacles triangular, mantle included; pulmonary orifice protected by a branchial appendage. Foot large.

Shell sinistral, thin, patelliform, depressed, non-spiral, apex directed to the right; aperture very wide; peritreme continuous, simple, entire.

Jaws three, covered with papillæ, one superior, small, transversely oblong, two lateral, long, very slightly arcuate, contiguous to the superior.

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Lingual membrane broad; teeth crowded, numerous; central

Fig. 231.

Lingual dentition of *Ancylus newberryi*.

minute, narrow, simple; laterals broad, bicuspid, the inner cusp the larger.

The *Ancyli* and *Arcroloxi* are widely distributed over the globe. In North America the known species are most numerous in those States where conchological observations have most been made, but an equal number may be found in other regions when they come to be explored. They are found in the extreme north and in Mexico, at every station.[1]

The name *Ancylus* is universally adopted at the present time.

The shell of *Ancylus* is dextral, the apex being directed to the right, but the generative, respiratory, and anal orifices are on the left of the animal, as in *Planorbis*.

So slight are the points of specific distinction in the species of this genus, and so meagre is the material at my disposition, I have considered it best at present to give all the descriptions of species yet published, leaving the synonymy to be decided upon at another time.

Ancylus obscurus, HALDEMAN.—Shell ovate, somewhat elevated, rather wide, apex but slightly projecting, rather more than one-third of the shell posterior; lateral margins slightly convex; lateral slopes rectilinear; posterior slope with a very slight depression; anterior slope nearly rectilinear. Color dark brown, margin diaphanous. Dimensions: long. 5, lat. 3.5, elev. 1.5 mill. Found in Nolachucky River, below Greenville. (*Haldeman.*)

Fig. 232.

Ancylus obscurus.

Ancylus obscurus, HALDEMAN, Mon. 9, pl. i, f. 5 (1844).

Adams quotes it from Jamaica (Contr. to Conch. 50); Shuttle-

[1] Dr. J. G. Cooper found them 7100 feet above the sea on the Sierra Nev da.

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worth (in Berne Mittheil., 1854, p. 98) quotes it from St. Thomas, Jamaica, and Porto Rico.

Ancylus fuscus, ADAMS.—Shell thin, transparent without the epidermis, not much elevated, elliptical, moderately curved at the sides; epidermis brown, visible through the shell, giving it the appearance of having the same color, thick, rough, slightly extending beyond the margin of the shell; apex obtuse, moderately prominent, scarcely behind the middle, inclining to the right so as to have only two-fifths of the width on that side. Length .31 inch, width .22 inch, height .05 inch. Cabinets of Bost. Soc. Nat. Hist., of Mr. Kinne Prescott of Andover, and my own.

Fig. 233.

Ancylus fuscus.

Habitat and station. This species was found adhering to stones in a small rivulet, at Andover, by Mr. Kinne Prescott, to whom I am indebted for many interesting species of shells. It has also been found at Mansfield.

This species is easily distinguished by its epidermis. The *A. rivularis*, Say, differs also in being much more narrow, having its sides straight, and its apex more acute; and *A. tardus*, Say, is more elevated, and in both of these the apex does not incline so far to the right as in our species. The *A. lacustris*, Drap., is more narrow, with an apex more elevated and acute, and *A. fluviatilis*, Drap., has the apex more prominent and nearer one extremity. (*Adams.*)

Ancylus fuscus, ADAMS, Bost. Journ. Nat. Hist. III, 329, pl. iii, f. 17 (1840); Am. Journ. Sc. [1], XXXVIII, 396 (1840).—HALDEMAN, Mon. 12, pl. i, f. 7 (1844).—GOULD, Inv. 224, f. 152 (1841).—DEKAY, N. Y. Moll. 13 (1843).—ANONY. Can. Nat. II, 212, fig. (1857).

The original description and figure are copied above. It has also been found in Ohio and the District of Columbia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8819	20+	Massachusetts.	W. Stimpson.	Cabinet series.
8531	3	Ohio.	I. A. Lapham.	.....

Ancylus elatior, ANTHONY.—Shell very much elevated, ovate; lines of growth distant, conspicuous: color light green, opaque; apex deciticated, recurved, sub-central; anterior and posterior slopes convex; lateral slopes plane; apical region rose colored.

Fig. 234.

Ancylus elatior.

Hab. Green River, Kentucky, adhering to small stones and dead shells. Very rare. My cabinet; cab. Lyc. N. H. Length .26 inch (6½ mill.), breadth 0.21 inch (5 mill.), height .14 (3½ mill.).

Obs. This is rather a heavy, robust species, and one not easily confounded with any other; it most nearly resembles, perhaps, *Ancylus crassus*,

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Hald., but differs from it in being more elevated, in having the lines of growth coarser, and by its rosy apex. It is more elevated than any other specimens of the genus with which I am acquainted.

It is somewhat singular that this should have been the only species of *Ancylus* noticed on a journey of nearly eighteen hundred miles, during which every stream was examined for shells, and this genus was anxiously sought for. (*Anthony.*)

Ancylus elatior, ANTHONY, Ann. N. Y. Lyc. VI, 158, pl. v, f. 20–21 (1855).

Mr. Anthony's description and figure are copied above.

Ancylus diaphanus, HALDEMAN.—Shell thin in texture, diaphanous, very wide, nearly circular, depressed; apex obtuse, almost central? Slope scarcely convex. Color very pale olivaceous, translucent, aperture white. Long. 5.5, lat. 4.5, elev. 2 mill.

Fig. 235.

Ancylus diaphanus.

Discovered in Ohio, by Mr. Anthony.

Distinguished by its circular and flattened form, and central inconspicuous apex. (*Haldeman.*)

Ancylus diaphanus, HALDEMAN, Mon. No. 3, p. 3 of cover, 1841; p. 8, pl. i, f. 4 (1844).—DEKAY, N. Y. Moll. 13 (1843).

Also said to have been found in Wisconsin.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8530	2	Milwaukee, Wis.	I. A. Lapham.	Cabinet series.

Ancylus haldemani, BOURGUIGNAT.—Shell small, oval, elliptic, pale, thin in texture, depressed; ends similarly curved, sides convex, slope nearly rectilinear; apex obtuse, with more than one-third the shell behind it. Long. 4, lat. 2.5, elev. 1.5 mill.

Fig. 236.

Ancylus haldemani.

Houston River, in Washington County, southwestern Virginia.

Paler, more depressed, and with a less prominent apex than *A. rivularis* and *tardus;* posterior slope less concave than in the former, and not direct, as in the latter. (*Haldeman.*)

Ancylus haldemani, BOURGUIGNAT, Pr. Zool. Soc. London, 1853, p. 83.
Ancylus depressus, HALDEMAN, Mon. 6, pl. i, f. 12 (1844).

On the authority of Bourguignat's Memoir on *Ancylus*, *l. c.*, I adopt another name for this species. There is an *A. depressus* of Deshayes, 1824 (*vide* Encycl. Méth. II, 48), and of Keferstein, 1834.

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Ancylus sallei, BOURGUIGNAT.—Shell convex anteriorly, posteriorly rectilinear or slightly convex; left side convex, right side rectilinear; posterior apex declining to the right, its summit obtuse so as to be quite indiscernible. Shell small, very fragile, diaphanous, very finely radiated, yellowish. Aperture oblong, 1½ mill. high, 5 mill. long, 2 mill. broad.

Found by Mr. Sallé on fragments of decaying wood in the Laguna Larga de Toxpam, near Cordova, Vera Cruz. (*Bourguignat.*)

Ancylus sallei, BOURGUIGNAT, Mag. de Zool. 1857, 16.

I have seen no specimens of this species. The original description is translated above.

Ancylus parallelus, HALDEMAN.—Shell pale, thin, and delicate; lengthened; sides subrectilinear, diverging slightly forwards; apex rather sharp, conspicuous, with two-fifths of the shell posterior to it. Dimensions: Long. 0.25, lat. 0.15, elev. 0.08 inch (Adams).

Fig. 237.

Ancylus parallelus.

Inhabits New England.

In general appearance resembles *Velletia lacustris*, Müll., of Europe, but is at once distinguishable by having the apex directed towards the right. Professor Adams remarks: "It was supposed to be Say's *A. rivularis*, not on account of any resemblance between the two shells, but from the meagreness of the description. From some remarks of this learned naturalist, comparing *A. rivularis* with *A. tardus*, it seems probable that the former is not an elongate species." (*Haldeman.*)

Ancylus parallelus, HALDEMAN, Mon. pt. 2, p. 3 of cover (1846); p. 11, pl. i, f. 6 (1844).—ADAMS, Shells of Vt. 164 (1842).—DEKAY, N. Y. Moll. 13 (1843).

Ancylus rivularis, GOULD, Inv. of Mass. 224, f. 153 (1841), teste HALDEMAN.—ANON. Can. Nat. II, 212, fig. (1857).

Dr. Gould's *Ancylus rivularis* is considered by Haldeman to be this species and not *A. rivularis*, Say.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8818	4	Massachusetts.	W. Stimpson.	Cabinet series.

Ancylus rivularis, SAY.—Shell corneous, opaque, conic-depressed, apex obtuse, nearer to and leaning towards one side and one end; aperture oval, rather narrower at one end, entire; within milk-white. Length one-fourth of an inch. Cabinet of the Academy.

Fig. 238.

Ancylus rivularis.

Common; adhering to stones in rivulets; the animal resembles the inhabitant of shells of the genus *Limnæa*, the tail is very obtuse, rounded. (*Say.*)

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Ancylus rivularis, SAY (Oct. 1819), J. A. N. S. I, 125 (1819); Nich. Enc. ed. 3: ed BINN. p. 60.—HALDEMAN, Mon. 4, pl. i, f. 1 (1844).—DEKAY, N. Y. Moll. 12, pl. v, f. 98 *a*, *b* (1843).—MRS. GRAY, Fig. Moll. An. cccx, f. 5.—Not of GOULD (= *A. parallelus*).

Also noticed in Virginia and Wisconsin. The figure is copied from Haldeman.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8223	5	Milwaukee, Wis.	I. A. Lapham.	.....
8492	1	.....	J. G. Anthony.	Cabinet series.

Ancylus tardus, SAY.—Shell conic depressed; apex behind the middle obtuse, rounded, inclining backward but not laterally; line from the apex to the posterior tip rectilinear; line from the apex to the anterior tip arcuated; aperture oval, not distinctly narrowed at one end. Length a little over three-twentieths (4.25), breadth one-tenth of an inch.

Fig. 239.

Ancylus. tardus.

Differs from *A. rivularis*, Nob., which has the apex leaning towards one side, and the aperture narrower at one end. It is less elongate than *fluviatilis*, Drap., which has an acute and laterally inclined apex.

It inhabits the Wabash River. (*Say.*)

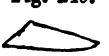
Ancylus tardus, SAY, N. H. Diss. Jan. 15, 1840,; Descr. 26: ed. BINNEY, 149.—HALDEMAN, Mon. 7, pl. i, f. 3 (1844).—ADAMS, Shells of Vt. 164, fig. (1842).—DEKAY, N. Y. Moll. 13 (1843).

Mr. Say's type is in the collection of the Philadelphia Academy. The species is said to have been found also in Vermont and the District of Columbia. The figure is copied from Haldeman.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8529	50	Mohawk, N. Y.	Dr. J. Lewis.	Cabinet series.

Ancylus calcarius, DEKAY.—Shell conic, calcareous, opaque. Apex not central, moderately prominent; aperture oval, entire; the curves on the longest sides dissimilar. In very minute specimens, the edges somewhat everted. Epidermis rufous, extending beyond the edge of the aperture; within, bluish-white, darker towards the apex. Length 0.3, height 0.12.

Fig. 240.



Ancylus calcarius.

The specimen which furnished the above description was one of the largest which I have seen. They are more commonly of the

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dimensions of *A. rivularis*. I separate it from this latter, chiefly on account of its solid, calcareous structure. I am indebted to Mr. I. Cozzens for the specimens from the Passaic River, near Paterson, but it will doubtless be found in this State. (*DeKay.*)

Ancylus calcarius, DEKAY, N. Y. Moll. 13, pl. v, f. 99 *a*, *b* (1843).

Fig. 240 is copied from one of DeKay.

Ancylus pattelloides, LEA.—Shell large, thick, elliptical, spotted, obliquely conical; striæ minute, crowded; apex submedial.

Fig. 241.

Ancylus pattelloides.

Arroya San Antonio, California: Dr. Trask. (*Lea.*)

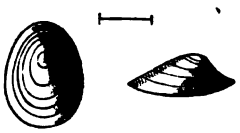
Ancylus pattelloides, LEA, Proc. Acad. Nat. Sc. Phila. 1856, VIII, 80.

Fig. 241 is copied from Mr. Lea's original specimen. The species seems nearest allied to *A. crassus.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8577	3	.....	.....	Cabinet series.
9203	1	San Francisco.	Judge Cooper.	(Really this species?)
9339	5	Canoe Creek, Cal.	Newberry.	.....

Ancylus kootaniensis, BAIRD.—Shell ovate, ashy, concentrically striate, vertex anterior, obtuse, shining within. Length ¼, breadth ⅛ inch.

Fig. 242.



Ancylus kootaniensis.

Hab. Rivers Kootanie and Spokane, British Columbia. Brit. Mus.

The shell is of an ovate form, and is concentrically striated, though the striæ only appear on the lower two-thirds of its surface, the apex being smooth and shining. Internally the shell is shining and somewhat pearly. (*Baird.*)

Ancylus kootaniensis, BAIRD, Proc. Zool. Soc. London, 1863, 69.

The above description is copied from the original. Fig. 242 is drawn from the advance plates of the Report of the British Boundary Commission.

Fig. 243.

Ancylus caurinus.

Ancylus caurinus, COOPER.

Ancylus caurinus, COOPER, in Reports on Nat. Hist., &c., of Minnesota, Nebraska, Washington, &c., p. 378 (1859); P. R. R. XII, 378.

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Black River, near Puget Sound.

The shell figured is from Judge Cooper's collection. No description of it was ever published.

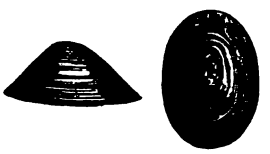
Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9098	1	California.	Judge Cooper.	Type figured.

Ancylus newberryi, LEA.—Shell large, obtusely pyramidal, opaque, smoky red, sides somewhat compressed; apex sub-central; aperture elliptical.

Klamath Lake, California: Dr. J. S. Newberry. (*Lea.*)

Ancylus newberryi, LEA, Proc. Acad. Nat. Sc. Phila. 1858, 166.

Fig. 244.



Ancylus newberryi.

The figures I have given above are from authentic specimens of *A. newberryi.* They are the size of the shell, which is extremely large for the genus.

It was from this species that the Fig. 231, on page 139 was drawn.

The lingual membrane is composed of 72 rows—55 denticles in a row; central tooth minute, laterals bidentate; uncini irregularly denticulated.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9337	1	California.	.....	Fig. 244. Type.
9338	..	.....	.....	Lingual membrane figured. Fig. 231.

Ancylus crassus, HALDEMAN.—Shell coarse, somewhat ponderous, wide, ovate, elevated, lines of growth conspicuous; apex eroded, placed far back; anterior and lateral slopes convex, posterior slope steep and rectilinear. Color opaque chestnut-brown. Dimensions: Long. 8, lat. 6.25, elev. 3 mill.

Fig. 245.

Ancylus crassus.

Brought from Oregon by Mr. Nuttall.

Distinguished by its opacity and thick texture—all the preceding species being more or less translucent and delicate. (*Haldeman.*)

Ancylus crassus, HALDEMAN, Mon. p. 14, pl. i, f. 8 (1844).

Fig. 245 is copied from Haldeman's, whose description is also given above.

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Ancylus fragilis, TRYON.—Shell very small and fragile, sides nearly parallel or slightly incurved in the middle, but diverging anteriorly; ends rounded. Apex elevated, acute, curved backwards, with about two-thirds of the shell anterior to it. Size of the largest specimen: Length 4, breadth 1.15, height 1 mill. Most of the specimens do not exceed two-thirds of the dimensions.

Fig. 246.

Ancylus fragilis

Laguna Honha, California: Rev. J. Rowell. My cabinet, and cabinet of Mr. Rowell.

This species is smaller, thinner, and wants the convex lateral margins of our *Anc. rivularis*, Say. It agrees with that shell, however, in the greater width of its anterior end, while in the shape of its lateral margins it resembles *Anc. parallelus*, Hald. It is much the smallest of our species. (*Tryon.*)

Ancylus fragilis, TRYON, Proc. Phila. Acad. Nat. Sc. 1863, 149, pl. i, f. 15.

Mr. Tryon's description and figure are copied above.

DOUBTFUL SPECIES OF ANCYLUS.

Ancylus drouetianus, BOURGUIGNAT.—Shell slightly convex anteriorly, straight posteriorly; summit small, sharp, contracted on its sides, recurved and resting on the posterior wall of the shell, a support which does not always secure it from fracture. Apical depression invisible on account of the apex being bent backwards. Shell very smooth, shining, transparent and horn-colored; surface divided into fifteen triangular compartments, commencing at the apex and enlarging towards the base of the shell, the dividing ridge marking the peristome in an undulating manner. Length 6, height 2–2½, breadth 5 mill.

Fig. 247.

Ancylus droustianus.

Habitat unknown, but from its characteristics probably belonging to North America. Dedicated to my friend Henry Drouet of Troyes.

Belonging to the group of *A. crassus*, *radiatilis*, *rivularis*, &c., but easily distinguished by its triangular divisions and undulating peritreme. Its apex and mode of growth also distinguish it from *A. riparius* and *vitraceus*, which share its other characteristics just mentioned, though they have a very apparent apical depression. (*Bourguignat.*)

The above description and figure are copied from Bourguignat's Memoir on *Ancylus* (Proc. Zool. Soc. 1853, p. 92, pl. xxv, f. 10–17).

Having never seen or heard of any such species in the United States, I doubt its existence there, but have given the description and figure to facilitate its recognition should it be found.

Ancylus filosus is an *Acroloxus*.

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ACROLOXUS, Beck.

Tentacles and mantle as in *Ancylus*? Foot large.

Shell dextral, elongated, oblong, patelliform, non-spiral; apex near the middle, directed to the left; aperture very wide; peritreme continuous, simple, entire.

Jaws (of *A. lacustris*) covered with crowded papillæ; upper large, quite arched, laterals rather high, but little approached, narrow, attenuated and pointed below.

Lingual membrane with a central tooth, and twelve lateral teeth on each side, then one tooth of a different form, and lastly six more on each side.

Acroloxus has a sinistral shell, the apex being on the left, but the orifices of the animal are on the right. It further differs from *Ancylus* in its lingual dentition.

The name *Vellettia* is sometimes used for this genus, because Beck gave no description of *Acroloxus*. He gives, however, a list of species sufficiently well known to make the generic distinction evident.

I follow the same plan as in *Ancylus* in giving all the original descriptions and figures of this genus.

Acroloxus nuttallii, Hald.—Shell fuscous, oval, elevated, apex one-fourth of the entire length from one end. Length $\frac{1}{4}\frac{3}{5}$, breadth $\frac{1}{4}$, height $\frac{1}{8}$ inch.

Oregon: Mr. Nuttall. (*Haldeman.*)

Vellettia nuttallii, Haldeman, Mon. pt. 3, p. 3 of cover (1841).—DeKay, N. Y. Moll. 13 (1843).

This is the only known recent species of North American *Acroloxus*, unless *Ancylus filosus*, Conrad, should prove one.

Ancylus filosus, Conrad.—Shell regularly oval, rather elevated, with numerous radiating prominent lines; apex very prominent, inclined, eroded, not nearly central.

Fig. 248.

Ancylus filosus.

Inhabits the Black Warrior River, south of Blount's Springs, Alabama. It is abundant on various species of *Melania*. (*Conrad.*)

Ancylus filosus, Conrad, N. Fr. W. S. p. 57 (1834): ed. Chenu, p. 26.—Haldeman, Mon. p. 10, pl. i, f. 9 (1844).

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—DeKay, N. Y. Moll. 13 (1843).—Müller, Syn. Test. 1834 prom. p. 2 (1836).

In the plate referred to, Prof. Haldeman calls this species a *Vellettia*. In the text he placed it in *Ancylus*. I have copied his figure.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8950	..	Alabama.	J. G. Anthony.	Cabinet series.

Fossil Species of Acroloxus.

Dr. Meek gives me the following name of a fossil species:—

Acroloxus minutus, Meek & Hayden MSS. (*Ancylus minutus*, Proc. Acad. 1856, p. 120.)

GUNDLACHIA, Pfeiffer.

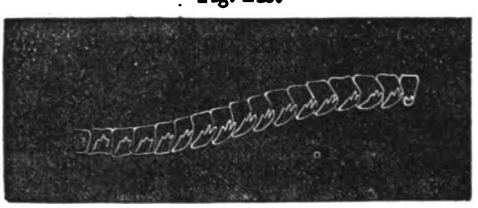
Tentacles — ? Mantle — ? Foot — ?

Shell thin, ancyliform, non-spiral, obliquely conical; apex inclined backwards, basal side two-thirds closed with a flat, horizontal lamina; aperture anterior, horizontal, semicircular; peritreme continuous, simple, entire.

Jaw — ?

Lingual membrane (of *G. californica*) with a small bicuspid

Fig. 249.



Lingual dentition of *Gundlachia californica*.

central, and 16, oblique, tricuspid lateral teeth.

This is a strictly American genus as far as is now known, species having been described from the West Indies and Central America. In the Boston Proc. 1863, 249, will be found an extremely interesting account by Dr. Stimpson of the growth of the animal.

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Gundlachia californica, ROWELL.—Shell with the aperture suboval, obliquely expanded towards the left, posteriorly rounded, and wider anteriorly. Internal shelf reaching forward about one-fifth the length of the shell, its margin slightly concave and oblique. Dorsal surface convex, becoming somewhat keel-shaped towards the apex, which is strongly and obliquely deflected so as to make the right border nearly a straight line, while the expansion on the left projects nearly as far back as the apex at an obtuse angle. Structure corneous, with strong concentric lines of growth and faint radiating striæ. Color dark brown, opaque; inner surface shining and purplish, the plate white towards the edge, and in some specimens showing a thickened, white semicircle continuous with its margin across the arch of the shell. Length about sixteen one hundredths, breadth eight one hundredths, and height six one hundredths of an English inch.

Fig. 250.

Gundlachia californica.

More than fifty specimens were found on water plants in clear stagnant ponds, two or more often sticking on the back of a larger one.

The discovery of this little shell in California is of great interest, the only species hitherto known being found in Cuba. The generic characters of this shell are strictly parallel with that species, while those mentioned as specific easily distinguish it. The Cuban shell is more elongated, regularly oval, the apex projecting considerably beyond the margin of the aperture, which is not obliquely expanded posteriorly. Its size is about one-fifth larger than that of ours. According to Bourguignat, the young shell is a simple obtuse cone, with a semicircular aperture formed by the edge of the shelf, and the thickened dorsal margin; but as it grows the animal changes the form of the aperture until the opening beneath the shelf becomes like the small end of a broad funnel, which in some of our specimens is still shown by the white semicircular ring.

The shell much resembles that of the marine *Crypta* (*Crepidula*), and also *Navicella* of tropical estuaries; but the animal is quite different in the Cuban species, and will undoubtedly prove so in the Californian. (*Rowell.*)

Gundlachia californica, ROWELL, Proc. Cal. Acad. Nat. Sc. III, 21, March, 1863.

I have seen no specimen of this shell whose original description and figure are copied above. Fig. 251 is drawn from an authentic specimen received by Dr. J. G. Cooper.

Fig. 251.

Gundlachia californica.

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From one of the same lot the lingual membrane figured on page 148 was drawn.

Gundlachia meekiana, STIMPSON.—The full-grown shell, in general form, is ovate. It is much broader than in *G. ancyliformis*, and has a less ovate aperture than in *G. californica*, as may be seen by comparison of the figures. The shell consists of two distinct parts, and from above looks very much like a small and thick, black *Ancylus*, sticking obliquely and to the right upon the posterior end of the back of a larger thin and whitish one. These two parts we will call, for convenience, respectively the smaller shell and the larger shell. The two parts nearly resemble each other in outline, each being oblong, roundedly truncate before, and narrowed and somewhat obliquely truncated behind, the right posterior angle being prominent. The dorsal part, or smaller shell, as before stated, is black opaque, and comparatively thick. It is about one-third as long as the larger shell, and has the usual form of a young *Ancylus*, the very obtuse apex being at the posterior third of its length and inclined to the right. Anteriorly it is continuous with the dorsum of the larger shell, but posteriorly it projects freely over and beyond the margin of that shell, at its posterior dexter angle, at a distance equalling rather less than a fourth of its own length. Inferiorly, the entrance of this projecting portion of the smaller shell is closed by a flat septum, extending from margin to margin, and continuous anteriorly with the dorsum and internal shelf of the larger shell presently to be described.

Fig. 252.

Gundlachia meekiana.

The larger shell is thin, translucent, presenting signs of rapid growth, and usually of a whitish or very pale horn-color. It is more expanded to the left than to the right, the dorsum and left slope being strongly convex, while the right slope is nearly straight. It is marked with prominent striæ of growth and indistinct radiating lines. Within, at the narrower posterior end, there is a rather strong white shelf, formed by the soldering of the dorsum of the larger to the septum of the smaller shell, which extends forward and upward, nearly to the bottom of the concavity, leaving, however, an aperture which leads into the cavity of the smaller shell, in which the liver of the animal is seated. This aperture is exactly semilunar in shape, its longer diameter being of course coincident with the width of the smaller shell and equalling about one-third that of the larger shell. In younger specimens the shelf is a little less extensive, and the apical aperture somewhat larger.

The soft parts of the animal, except in the form of the visceral sack, agree so closely with those of true *Ancyli*, that I have not succeeded in finding any differences of importance. I add here a figure of its lingual

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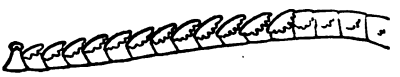
dentition. This resembles very nearly that of a species of *Ancylus* common in the District (which appears to be the *A. rivularis* of Say and Hal-

Fig. 253.



Lingual dentition of *Gundlachia meekiana*.

deman), differing from it only in having two or three teeth less in number, and in the more numerous denticles with which its lateral teeth are armed.

After a close examination of the above characters, I have ventured to suggest that the *Gundlachia* commences its life as an *Ancylus*; the smaller shell, in which the earlier period of its life is spent, being undistinguishable in form from the shells of that genus. It is probable that it passes the first summer and autumn of its existence in this smaller shell, and that the septum which afterwards partially closes its aperture is formed during the period of inaction which ensues during the winter.

This septum would in some degree serve as a protection to the mollusk during this period, in the same way as the epiphragm of the *Helices*.

In the following spring—the period of greatest activity in growth with all the fresh-water Pulmonates—the animal throws forth its newer and larger shell, retaining the older one on its back for the protection of its more tender viscera. It therefore will be a matter of great interest and importance to observe these animals in the latter part of winter, when the formation of the newer shell is about to commence. At that period, they will be found to present the primary form, namely, that of an *Ancylus* with two-thirds of its aperture closed by a septum, leaving but a small opening for the egress of the foot of the animal.

This remarkable little mollusk, of a genus new to our Fauna, has occurred to me in one locality only, a small pond of clear water, in a marshy bank of the Potomac, on the northern side, between Georgetown and the Little Falls in one direction and between the canal and the river on the other. The pond is about one mile below the so-called "Chain Bridge." Five specimens only were found after repeated search.

I have dedicated this species to my friend, Mr. F. B. Meek, the most accurate of American investigators in Fossil Conchology, the pleasure of whose company I enjoyed during several excursions for the purpose of procuring specimens of it. (*Stimpson.*)

Gundlachia meekiana, Stimpson, Proc. Bost. Soc. 1863, 249, fig.

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SUBORDER THALASSOPHILA.

Eyes sessile on the front part of the frontal disk formed by the expanded tentacles. Operculum sometimes present. Animal marine, or living in the vicinity of the sea.

There are two families now known to belong to this suborder, one of which, *Amphibolidæ*, is not represented in this country; species belonging to it are furnished with an operculum and are still more marine in their habits than the *Siphonariidæ*. Still, they have the lingual dentition of Pulmonata, the mantle margin nearly closed, and but rudiments of gills.

FAMILY SIPHONARIIDÆ.

Lingual membrane broad, rather long; teeth numerous, equal, in slightly arched, cross lines; the central tooth narrow, elongated, with a small, rhombic apex; the lateral teeth larger, diverging, gradually diminishing in size towards the outer side of the series, and furnished with a rather oblique, curved tip. Head with a large frontal disk, bilobed in front, and formed by the expanded tentacles; eyes sessile on the outer side of the disk. Respiratory orifices covered by a large fleshy lobe of the mantle.

Operculum none. Shell conical, patelliform, with an internal groove on the right side.

The *Siphonariidæ* are marine in their habits, living near the sea, on rocks between tide marks, or higher above the water but dashed by the spray.

The single genus of the family is represented in this country.

SIPHONARIA, BLAINV.

Shell trumpet-like, orbicular, depressly conical; apex subcentral, oblique, recurved posteriorly; aperture wide, margin irregular, crenulated; muscular impression crescentic; a syphonal groove on the right side, which is extended in a projection beyond the margin.

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Hermannsen uses the name *Siphonaria* in preference to *Liria*, Gray

The *Siphonariæ* are marine, being found adhering to rocks between tide marks; they have a widely extended geographical range, but are most numerous in the tropics.

Siphonaria alternata, SAY.—Shell conical, with upwards of thirty obsolete, hardly raised, unequal ribs; apex obliquely curved, the tip pointing nearly in a parallel direction with the surface of the shell, and acute; color brown, radiated with white; base oval. Breadth three-tenth inch.

Fig. 254.

Siphonaria alternata.

Inhabits the southern coast of East Florida.

It seems to approach the *leucopleura*, as described by authors, excepting that the base is not ovate, as the base of that shell is said to be. (*Say.*)

Patella alternata, SAY, Journ. Acad. Nat. Sc. V, 215 (1826): ed. BINNEY, 124.

Siphonaria alternata, SAY (1832), Am. Conch. IV, pl. XXXVIII: BINNEY'S ed. p. 192, pl. XXXVIII; ed. CHENU, 50, pl. XIII, f. 3.

I have not seen this species. Fig. 254 is copied from Say's figure.

Siphonaria æquilirata, CARPENTER.—Shell sub-conic, oval, regular, radiately ornamented with numerous subrugulose, equal ridges, the interstices being narrow and smooth; dark olive, ridges high; epidermis thin, adherent; internal surface dusky, hardly iridescent; edge crenulated; canal subcentral, scarcely showing exteriorly. Length .83, breadth .57, height .3.

Fig. 255.

Siphonaria æquilirata.

One specimen of beautiful growth in the Mazatlan collection agrees with a larger but somewhat irregular one in that of Mr. Cuming, in characters which appear to separate it from all varieties of *S. lecanium*. Riblets equal, interstices smooth, channel nearer the middle and not conspicuous either by swelling or special marking outside. The Mazatlan specimen has much broader interstices than that of Mr. Cuming; but as the riblets are bifurcating, it is probably not fully grown. There is no trace of striulæ. The examination of more specimens may possibly merge it into the polymorphous *S. lecanium*, from the extreme variety of which the non-prominence of the canal appears to separate it. (*Carpenter.*)

Siphonaria æquilirata, CARPENTER, Maz. Cat. 184.—REEVE, Con. Icon. 15.

Gulf of California. Mazatlan. Fig. 255 is copied from Reeve.

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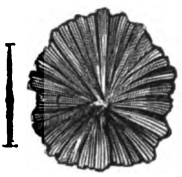
Siphonaria amara, REEVE.—Shell ovate, depressly conoid, apex anteriorly uncinate, radiately closely ribbed and ridged; black, rayed with white bands.

Fig. 256.



Siphonaria amara.

Chiefly to be recognized by its white rays upon a cinder black ground. (*Reeve.*)

Siphonaria amara, REEVE, Con. Icon. 33.

California. Reeve's description and figure are given above.

Siphonaria lecanium, PHILIPPI.—Shell small, usually ovate, sometimes subcircular, projecting at the channel; subconic or very much depressed; ash-colored, variously colored with red; epidermis thin, adherent; ribs at unequal or regular intervals, subacute or very much rounded, the intervals usually with more delicate riblets; stronger ribs from twelve to twenty-two; both ribs and riblets delicately marked by radiating, subrugose striæ; ribs and internal margin sometimes white; apex sub-central, smooth, flattened; interior black or brown, more rarely white, very rarely greenish; margin irregularly crenulated or stellate; rounded ribs projecting; channel declining. Length of the largest flattened form (including palmations) .96, lat. .89, alt. .18; of a sub-conical specimen, .76, alt. .24 inch.

Mazatlan. (*Carpenter.*)

Siphonaria lecanium, PHILIPPI, Z. für Mal. IV, 51 (1846).—CARPENTER, Br. Mus. Cat. Reig. 182 (1856).

The above is Mr. Carpenter's description of an extremely variable species. He suggests the flattened form with stout, rounded, projecting palmate ribs should be called var. *palmata*.

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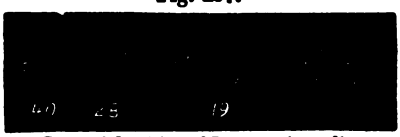
ADDENDA, ETC.

Limnæa stagnalis. (See p. 28.)

Fig. 257 represents the lingual dentition of a specimen lately

Fig. 257.



Lingual dentition of *Limnæa stagnalis.*

received from the Lake of Geneva. There are 100 rows of 47 . 1 . 47 teeth each.

Bulinus berlandierianus.—Shell cylindrical, smooth, whitened, rather thick; whirls five, the upper ones narrowly flattened, the lower one comprising more than fifteen-seventeenths of the whole length of the shell; quite compressed; aperture very long, narrow; columella simple, with a light callus. Length 17, greatest breadth 8; of aperture, length 14, breadth 4 millimetres.

Bulinus berlandierianus, W. G. BINNEY, Am. Journ. of Conch. I, 51, pl. vii, f. 8.

Fig. 258.

Bulinus berlandierianus.

Texas, in the region of Matamoras.

Six specimens were presented to the Smithsonian Institution by Gen. Couch, among the shells collected by Berlandiére.

Fig. 259.

Bulinus hypnorum.

This species resembles *Bulinus elatus*, Gld., more than any other known to inhabit North America. But that species is very much thinner and delicate, has a longer, more pointed spire, a shorter aperture and more convex body whirl.

Fig. 259 is drawn from the largest American specimen of the widely distributed *Bulinus hypnorum*. It shows how slight is the resemblance to that species in *B. berlandierianus.*

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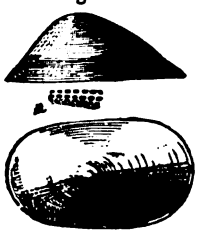
Ancylus borealis, MORSE.—Shell elliptical, solid, light yellow, apex elevated, rounded, very obtuse, nearer the posterior margin of the shell; lateral slopes steep, anterior slope slightly convex, near the apex; posterior slope straight. Fine regularly interrupted radiating lines mark the surface of the shell from the apex to the borders; incremental lines irregular. Length .14 inch, breadth .09 inch, height .06 inch.

Fig. 260.



Ancylus borealis.

This species resembles *A. tardus* in its general form. It is much smaller, however, and has a strong heavy shell.

Discovered by John M. Gould, at Patten, in the northern part of the State. (*Morse.*)

Ancylus borealis, MORSE, Journ. Portland Soc. I, 45, f. 103, 104.

Acroloxus ovalis, MORSE.—I propose this and the following species with some reluctance, as the specific characters of nearly all the species of this genus are but faintly marked, and the danger of multiplying false species is but too apparent; still, believing these to be new, I present them.

Fig. 261.

Ancylus ovalis.

Shell very small, depressed, irregularly ovate, apex nearly central, round, smooth, and blunt, slightly inclined to the left, slopes irregular, caused by different periods of repose and growth, posterior slope in most specimens straight, anterior slope convex, lateral slopes steep, shell widening anteriorly; lines of accretion extremely fine, visible within but requiring a magnifier to discern them without, being greatly obscured by fine grains of sand agglutinated to the surface. Periostraca pale yellow, the surface when magnified exhibits about fifty-five delicate ribs, which radiate from the apex to the periphery of the shell. Length .12 inch, breadth .10 inch, height .06 inch.

This species was discovered by John M. Gould, in the Androscoggin River, at Bethel, Maine, in 1854. I have since found it in the above locality clinging to the under side of stones near the shore, in positions where it could in no way reach the surface of the water. (*Morse.*)

Ancylus ovalis, MORSE, Journ. Portland Soc. I, 44, f. 101, 102.

The descriptions and figures of this and the preceding species are copied from Morse.

On p. 103, before Planorbis, the following should be inserted:—

SUBFAMILY PLANORBINÆ.

Shell spiral, discoidal or depressed, many whirled; aperture crescentic.

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INDEX.

In the present index all synonyms and spurious species are in italics. Where several references are given for one name, the first generally relates to the page containing the full description.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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LAND AND FRESH-WATER SHELLS

OF

NORTH AMERICA.

PART III.

AMPULLARIIDÆ, VALVATIDÆ, VIVIPARIDÆ, FRESH-WATER RISSOIDÆ, CYCLOPHORIDÆ, TRUNCATELLIDÆ, FRESH-WATER NERITIDÆ, HELICINIDÆ.

BY

W. G. BINNEY.

WASHINGTON:
SMITHSONIAN INSTITUTION.
SEPTEMBER, 1865.

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PREFACE.

THIS volume, prepared at the request of the Smithsonian Institution, is devoted to all the operculated land and fresh-water mollusks of North America, excepting the family of *Melanians*. The descriptions of the *Cyclophoridæ*, *Truncatellidæ*, and *Helicinidæ* have already been published in the "Terrestrial Mollusks of the United States," Vols. 2 and 4. It will be seen, however, that these families are now grouped according to their lingual dentition and breathing organs, and not collectively as *Pneumonopoma*. In treating the fresh-water families, it has been considered better to give the original description, or an English translation of it, and a fac-simile in outline of the original figure of each species and synonym. This work must, therefore, be considered rather as a report on the present state of our knowledge of the subject. When the large area over which the species range shall have been explored and full suites of specimens obtained of every age, variety and locality, and when this volume shall have elicited criticism and prompted research, a complete monograph may then be prepared on the decisions of which the student can fully rely as correct.

An extensive correspondence with all the living American conchologists, and opportunities of examining the original specimens from which the descriptions of almost all the species were drawn, have enabled me to eliminate from the list of species a large number of synonyms. The original description and figure of these being given, the student can judge for himself of the correctness of my conclusions.

The descriptions of families and genera of the *Viviparidæ* and *Rissoidæ* are adopted from Dr. Stimpson, those of the former from his manuscript, of the latter from a paper entitled "Researches on the Hydrobiinæ and Allied Forms," lately published

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by the Smithsonian Institution. In the remainder of the work the descriptions of the "Genera of Recent Mollusca have been adopted."

The original figures of shells and lingual dentition were drawn by Mr. E. S. Morse, of Gorham, Maine.

The subject is brought down to January, 1864.

W. G. BINNEY.

BURLINGTON, N. J., September, 1865.

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LAND AND FRESH-WATER SHELLS

OF

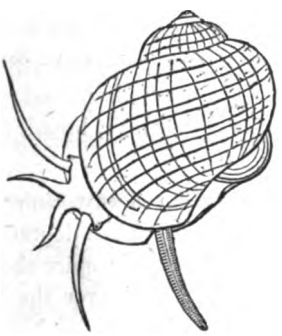
NORTH AMERICA.

III.

Family AMPULLARIIDAE.

Lingual membrane with seven series of teeth (3, 1, 3), central teeth acute, lateral subulate. Rostrum divided into two long tentacular lobes in front; tentacles long and filiform; eyes on peduncles at the outer bases of the tentacles. Mantle with a more or less elongated siphon on the left side in front; left gill rudimentary; mantle cavity with a large pulmonary sac on each side. Rectum not traversing the heart. Foot simple. Operculum annular, regular. Shell spiral, turbinate, covered with an olivaceous epidermis; aperture simple in front. Jaws present.

Fig. 1.



Animal of *Pomus depressa*, reduced one-half.

Fig. 2.

Lingual dentition of *Pomus depressa*.

The *Ampullariidæ* are fluviatile, and represent in the ponds and rivers of the tropics the *Viviparidæ* of more temperate climates. Although distinct gills exist, the respiratory cavity is very large and partly closed, so as to enable these animals to live a long time out of water; in fact, they appear to be

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truly amphibious, and to be enabled to survive a long drought, and have been known to revive after having been kept several years out of water. The long siphonal tube appears to be formed by the left neck-lappet, which is seen in the *Viviparidæ* in a rudimentary state.

But one genus of this family is represented in North America. In order, however, that the others may be understood by those not having access to the more recent works on general Conchology, I have added below the descriptions of H. & A. Adams.

Genus **Ampullaria.**—Respiratory siphon elongate. Operculum horny, with an external shelly coat. Shell globose, umbilicated; spire small, last whirl ventricose; aperture oblong, entire, peristome continuous, slightly reflexed, with an internal thickened rim or ledge.

Genus **Pomus,** HUMPHREY, characterized as below.

Genus **Marisa,** GRAY.—Siphon elongate. Operculum horny, dextral. Shell dextral, depressed, discoidal, deeply and widely umbilicated; spire very short, whirls rounded; aperture suborbicular, entire, peristome thin, simple.

Genus **Pomella,** GRAY.—Operculum horny, dextral. Shell solid, spire short, whirls transversely striated, the last very large; aperture semi-ovate, inner lip concave, broad, flattened, peritreme simple, acute.

Genus **Lanistes,** MONTFORT.—Operculum horny, sinistral, or with the nucleus on the left margin. Shell depressed, thin, sinistral, deeply and widely umbilicated; spire short; aperture oblong, entire; inner lip expanded over the last whirl, peristome simple, acute.

Genus **Meladomus,** SWAINSON.—Operculum horny, sinistral. Shell sinistral, thin, imperforate, covered with a dark olivaceous epidermis; spire produced, acuminated; aperture oval, reversed, contracted and acute posteriorly, entire in front, peristome thin, simple.

Genus **Asolene,** D'ORBIGNY.—Siphon not exposed. Operculum horny, with an internal shelly coat. Shell globose, solid; spire small, whirls rounded; aperture oval, entire; inner lip slightly thickened, peritreme simple, acute.

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POMUS, Humphrey.

Siphon elongate. Operculum horny, dextral. Shell dextral, globose, widely umbilicated, last whirl very large, ventricose; spire short; aperture entire, oblong, large, expanded, peritreme simple, always thin, sometimes subreflexed.

Fig. 3.

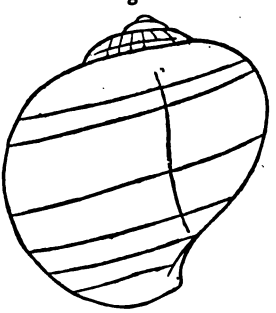
Pomus depressa.

The genus *Pomus* differs from *Ampullaria* in the absence of the thickened ledge within the peritreme for the operculum, which latter, moreover, is entirely horny. The species inhabit the lakes and rivers of warm countries, more especially those of South America and the West Indies. In the dry season they bury themselves deeply in the mud, where they remain in a state of torpidity, and, on account of their possessing a pulmonary cavity in addition to the gills, they are enabled sometimes to survive a considerable period after having been removed from the water. The South American Indians term them "Idol Shells," and are said to hold them in great veneration.

Pomus depressa, Say.—Shell ventricose, subglobular, obsoletely banded with obscure green; whirls four, slightly wrinkled; body whirl more prominent above, somewhat flattened towards the suture, of a pale olivaceous color, which is almost concealed by numerous unequal, longitudinal and transverse greenish and brownish lines; spire very much depressed; aperture suboval, within somewhat glaucous, on the margin exhibiting the bands distinctly; labrum simple, as much rounded above as below; umbilicus small, nearly closed. Greatest width one inch and nine-twentieths, total length one inch and a half; length of the aperture one and one-fifth of an inch nearly.

Inhabits East Florida.

Fig. 4.



Ampullaria depressa.

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During an excursion to East Florida, in company with Messrs. Maclure, Ord, and T. Peale, I obtained a single dead and imperfect specimen of this interesting shell. It occurred in a small creek, tributary to St. John's River, and on the plantation of Mr. Fatio. Captain Le Conte, of the Topographical Engineers, has since presented me with a perfect specimen, with the information that he observed them in very great numbers on the shores of Lake George, a dilatation of St. John's River; that in some places the dead shells were piled up confusedly to a considerable height, and that the *Numenius longirostra* feeds upon the living animal. The spire is still less elevated than that of the *globosa* of Swainson.

Ampullaria depressa.—As the name *depressa* of the Appendix to Long's Exped. p. 264, is preoccupied by Lamarck for a fossil species, it may be changed to *paludosa*. (*Say.*)

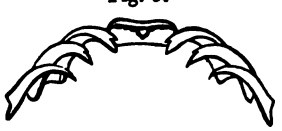
Ampullaria depressa, Say, Long's Ex. 264, pl. xiv, f. 2; Binney's ed. p. 130, pl. lxxiii, f. 2.—Haldeman, Mon. p. 5, pl. i, ii.—De Kay, N. Y. Moll. 124.—Hanley, Conch. Misc. pl. iii, f. 9.—Philippi, in Chemn. ed. 2, p. 52, pl. xvi, f. 4.

Ampullaria paludosa, Say, New Harm. Diss. II. 260; Desc. 22; Binney's ed. p. 147.

Ampullaria hopetonensis, Lea, Tr. Am. Phil. S. V, 115, pl. xix, f. 84; Obs. I, 227.—DeKay, N. Y. Moll. 124.—Reeve, Con. Icon. fig. 60.—Philippi, in Chemn. ed. 2, p. 36, pl. ix, f. 7.

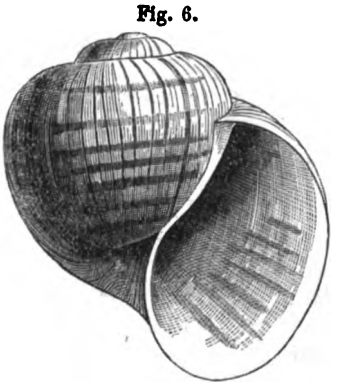
Figure 5 represents the lingual dentition of a specimen of *Pomus depressa* kindly furnished me by Prof. Agassiz. The teeth are light brown in color, and make thirty-four rows in all; the first and second laterals are notched and the third is simple. The central tooth has seven denticles, the central one quite large, the next two short and blunt, and the last rather long and blunt.

Fig. 5.



Lingual dentition of *Pomus depressa*.

Fig. 6.



Pomus depressa.

Mr. Say proposed the name *paludosa* because his first name, *depressa*, was preoccupied by Lamarck, An. s. Vert. 1822. Since, however, that *Ampullaria depressa*, Lam. has been removed to the genus *Natica*, I adopt Mr. Say's first name. Figs. 1 and 3, represent the animal and operculum of this

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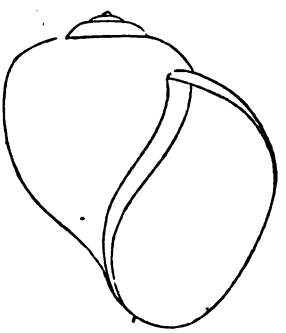
species, the former, copied from Haldeman, being reduced in size. Fig. 4 is a fac-simile of the outline of Say's figure, and fig. 7 of Mr. Lea's of *A. hopetonensis*. Fig. 6 represents a specimen from Georgia. I have no doubt of the identity of this last named species with *depressa* after examining the typical specimen. No. 8986 and 8987 were labelled by Mr. Lea as *hopetonensis*. Haldeman also places it in the synonymy. The original description here follows, and an outline of the figure (7).

Ampullaria hopetonensis.—Shell subventricose, smooth, flattened above, umbilicate, yellowish-brown, banded; sutures impressed; whirls 5; aperture subovate, white.

Habitat Hopeton, near Darien, Ga. Prof. Shepard. My cabinet; cabinet of Prof. Shepard. Diam. 1.4, length 1.7 inch. I owe to the kindness of Prof. Shepard of New Haven this interesting shell. It was procured by him during his late geological investigations in our Southern States, with other shells, descriptions of which will be found in these memoirs. It resembles the *A. fasciata*, Lam., but is less globose, the whirls of our species being somewhat flattened on the side and top. It differs from the *A. depressa*, Say, described in Major Long's Exp. to St. Peter's River (subsequently changed to *A. paludosa* in the Disseminator) in being less globose, and in being flatter on the side and superior part of the whirls. (*Lea.*)

Fig. 7.



Ampullaria hopetonensis.

Inhabits Georgia and Florida.

In the preliminary Report on N. Y. Moll. 1839, 32, *A. paludosa* is included erroneously.

DeKay gives as synonyms *A. penesima*, Say, and *A. disseminata*, Say. The names do not occur in Say's writings, though the last is suggestive of the periodical in which the description of *A. paludosa* appeared. Dr. Martens (Mal. Blatt. IV, 204) refers *A. depressa* and *A. paludosa* to *A. hopetonensis*, disregarding the priority of Say's names.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8984	2	Florida.	W. G. Binney.	.....
8986	1	Silver Spring L., Fla.	O. M. Dorman.	.....
8987	1	" "	W. G. Binney.	.....
8988	1	Georgia.	J. G. Anthony.	.....
9306	..	"	L. Agassiz.	Lingual. Fig. 5.

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Spurious and Extra-limital Species of Ampullaridæ.

This family does not appear to belong to the molluscous fauna of the United States, but rather to that of South America. I have not, therefore, included the Mexican species.

Ampullaria crassa, Deshayes. Vide *Melantho ponderosa*.

Ampullaria borealis, Valenciennes, in Humboldt and Bonpland, Rec. d'Obs. II, 260, is probably *Lunatia heros*, Say. Ferussac (Bull. Zool. 1835, 2d sect. p. 33), in reviewing Valenciennes' work, refers it to a large marine *Natica* figured by Chemnitz. The description is as follows:—

"Shell ventricose, globose, heavy, thick, smoky white, broadly umbilicated, with longitudinal striæ but no wrinkles.

St. Pierre and Miquelon, near Newfoundland.

This species resembles *Am. guyanensis*. Its proportions are the same; it is longitudinally striate, but its shell is at least three times as thick, so that it is quite heavy. It is also distinguished by its very large umbilicus, while *A. guyanensis* has none. The color is yellowish or light reddish on the top of the last whirl; the base is white."—*Valenciennes.*

Ampullaria rotundata, Say.—Shell remarkably globose; length and breadth equal, dark brown, but becoming olivaceous towards the aperture; spire but little elevated; suture moderately impressed; body whirl a little undulated instead of being wrinkled; these undulations being very perceptible to the finger within the shell; aperture within on the margin thickened equally all round, and fulvous, with a slight groove for the reception of the operculum, hardly visible but palpable; within somewhat perlaceous; a little darker on the columella; umbilicus small, narrow; operculum calcareous, deeply and concentrically rugose, so as to appear stratified; nucleus on the side towards the labium submarginal. Length less than one inch and four-fifths; greatest breadth about the same.

For this interesting species we are indebted to Captain Leconte, of the Topographical Engineers, who informed me that he found it in St. John's River, in Florida.

It is most closely allied to the *A. globosa*, Swainson, a native of the rivers of India. But that shell is rather less globose, and does not appear to have the almost regular, but slightly elevated and very numerous undulations so perceptible towards the aperture on the body whirl of this species; which has also a few hardly perceptible, distant, brownish bands, particularly towards the base. It may, however, be only a variety of that species. (*Say.*)

Ampullaria rotundata, Say, N. Harmony Diss. II, 245; Discr. 27; Binney's ed. p. 147, pl. lxxv.—Philippi, in Chemn. ed. 2, p. 68.

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Ampullaria globosa, HALDEMAN, Mon. p. 8.—SWAINSON, Zool. Ill. II, 119.

I do not consider this and *Vivipara elongata* well established American species. If actually found in Florida, they were probably brought from Calcutta, where they both are found.

Ampullaria urceus, MÜLLER (*A. rugosa*, Lam.), is found in Mexico. (Vid. Humboldt & Bonpland, Rec. d'Obs. II, p. 258.) Of its presence in the Mississippi Mr. Say says: The "*Ampullaria urceus*, *L.* (*rugosa*, Lam.) is stated in the books to inhabit the Mississippi River; but I have never been so fortunate as to find it, or to gain any information relative to it there. Mr. O. Evans did me the favor to make inquiry at various places on that river, and to exhibit, as somewhat similar, a colored plate of the *A. globosa*, Swains., to persons from whom information might be expected, and amongst others to some Indians, who in general are known to be accurate observers; but no one has seen any similar shell in the waters of the Mississippi. I am therefore much inclined to believe that the species is a native of some of the more southern rivers, probably those of Texas. Any information in relation to it, or specimens of the shell, will be very acceptable." (BINNEY's ed. p. 195.) See also HALDEMAN, Mon. p. 11; MONTFORT, Conch. Syst. II, p. 244; LAMARCK, An. s. Vert. &c.

Ampullaria flagellata, SAY, N. H. Diss. II, 260; Descr. 22; BINNEY's ed. p. 147.—HALDEMAN, Mon. p. 10.—PHILIPPI, in Chemn. ed. 2, p. 38, pl. ix, f. 7. Near Vera Cruz (Mexico).

Ampullaria flatilis, REEVE, Con. Icon. pl. vii, fig. 31 (1856). Tobasco, Mexico

Ampullaria cerasum, HANLEY, Conch. Misc. Mexico.

Ampullaria miltocheilus, REEVE, Con. Icon. fig. 120. Chiapa, Mexico.

Ampullaria Ghiesbreghti, REEVE, Con. Icon. fig. 123. Chiapes, Mexico.

Ampullaria fumata, REEVE, Con. Icon. 124. Chiapes, Mexico.

Ampullaria violacea, VALENCIENNES, Rec. d'Obs. II, 260.

Ampullaria reflexa, SWAINSON, Phil. Mag. LXI, 377.

Ampullaria malleata, JONAS, Moll. Beit. I. 22.

Ampullaria paludinoides, CRIST., and JAN in Chemn. ed. 2, p. 27.

Ampullaria scalaris, D'ORB. Mag. de Zool. 1835, p. 31. (*A. angulata*, JAY, Cat. earlier ed., not of DUNKER.)

Pomacea linearis, PERRY, Conchology, pl. xxxviii, fig. 2.—Shell pale reddish-brown, slightly spotted with pale pink spots; mouth slightly shaded with a broad band of brown reaching round the body; the rim yellow. The shell is found on the coasts of North America, and is drawn from a specimen in the collection of Mr. Stuart. (*Perry.*)

This is the original description, and a copy of Perry's figure reduced one-half. I know nothing of the species.

Fig. 8.

Pomacea linearis.

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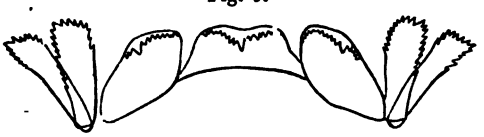
FOSSIL SPECIES.

Ampullaria ? perovata, CONRAD, Proc. Acad. Nat. Sc. Philad. III, 21, pl. i, fig. iii.

FAMILY VALVATIDAE.

Lingual membrane with teeth in seven series (3, 1, 3); the central teeth broad, with a hooked and denticulated apex,

Fig. 9.



Lingual dentition of *Valvata tricarinata*.

the lateral lanceolate, hooked and denticulated. Rostrum produced; tentacles cylindrical; the eyes sessile at their external bases. Mantle simple in front; gill plumose, exposed, the lamina pinnate, spirally twisted, protected by a long, slender respiratory lobe. Foot bilobed in front. Operculum horny, orbicular, spiral, many whirled; whirls with a thin elevated edge. Shell spiral, turbinate or discoidal, covered with an epidermis; aperture with the peritreme entire.

Fig. 10.

Operculum of *V. tricarinata*, greatly magnified.

The species of this family are distributed throughout the temperate regions of the globe, living in slow running rivers, ditches, and lakes.

I have copied Haldeman's figure of *Valvata sincera* to illustrate the animal of this family (fig. 11).

VALVATA, O. F. MÜLL.

Fig. 11.

Valvata sincera, greatly magnified.

Shell turbinate or discoidal, umbilicated, thin, whirls round, simple or keeled, covered with a horny epidermis; aperture circular, peristome continuous.

The species of this small genus inhabit the ponds and ditches of Europe and North America. When the animal progresses, the delicate, retractile, branchial plume is projected over the neck. The female

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deposits her eggs in a single, coriaceous, spherical capsule, which is affixed to stones or the stems of aquatic plants. Jaws present.

Valvata tricarinata, SAY.—Shell with three volutions; three revolving, carinate, prominent lines, giving to the whirls a quadrate instead of a cylindric appearance. Suture canaliculate, in consequence of the whirls revolving below the second carina and leaving an interval. Spire convex, apex obtuse. Umbilicus large. Carinæ placed, one on the upper edge of the whirl, one on the lower edge, and the third on the base beneath. Breadth one-fifth of an inch.

Inhabits the river Delaware. Rare. Found by Mr. Le Sueur, whose proposed name is here adopted. (*Say.*)

Cyclostoma tricarinata, SAY, J. Acad. N. S. Phil. I, 13, 1817; Nich. Ency. ed. 3; BINNEY'S ed. p. 68, 59, 56.

Valvata tricarinata, SAY, Journ. Acad. II, 173; BINNEY'S ed. 68.—DESHAYES in Lam. VIII, 507; Tr. El. de Conch. pl. lxxii, f. 4–6.—MENKE, Zeit. f. Mal. 1845, p. 121.—HALDEMAN, Mon. III, pl. i, f. 1–4.—GOULD, Invert. 225, f. 156.—DEKAY, N. Y. Moll. p. 118, pl. vi, f. 130. ANONYMOUS, Can. Nat. II, 213, fig.—ADAMS, Thompson, VI, 152.

Valvata carinata, SOWERBY, Gen. Shells, xli, f. 2.

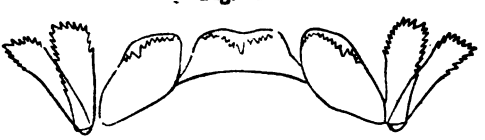
Valvata unicarinata, DEKAY, N. Y. Moll. 118, pl. vi, f. 129.

Valvata bicarinata, LEA? Tr. Am. Phil. Soc. IX, 21; Obs. IV, 21; Proc. II, 81, 83; Arch. f. Nat. 1843, II, 129.

Tropidina carinata, CHENU, Man. de Conch. II, 312, fig. 2232.

Troschel (*Gebiss der Schnecken*, p. 96, pl. vi, f. 14) figures the lingual ribbon of this species.

Fig. 12.



Lingual dentition of *Valvata tricarinata.*

This is a very variable species, as shown by No. 8981 of the collection. Variety *simplex* is contained in No. 8982; bicarinated forms in 8941. Mr. Say's specimens of *Valvata tricarinata* are still preserved in the collection of the Philadelphia Academy of Natural Sciences. From an examination of them and of Mr. Lea's original *Valvata bicarinata* I am convinced of the identity of the two. I have given (fig. 13) a figure of Mr. Lea's shell and his description below. Haldeman refers it with doubt to *tricarinata.*

Fig. 13.

Valvata tricarinata.

I have not seen authentic specimens of the other species men-

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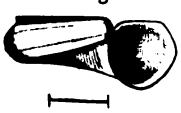
tioned in the synonymy. The original descriptions and fac-similes of the original figures now follow.

Valvata bicarinata, LEA.—Shell orbicular, flattened above, bicarinate, rather thick, horn-colored above, whitish below, widely umbilicate; sutures impressed; spire depressed; whirls four, convex; aperture rounded, whitish within.

Body rather short and white, head large, tapering, slightly enlarged at the anterior termination, with a black mark passing from the neck between the eyes, tapering off and reaching nearly to the end of the snout, where there are two oblique black marks bordered in front by white, and accompanied behind by several irregular white spots, the anterior ones being the larger. Branchia translucent, superior portion blackish, bordered with white spots and occasionally obtruded; eyes round and deep black, placed at the posterior base of the tentacula, surrounded by a white area; tentacula long, rather tapering, obtuse at the end; filament rather short, translucent with longitudinal white lines; foot wide and furcate anteriorly, where minute white spots may be observed. Operculum thin, semitransparent, light horn color, increment circular and rather coarse.

Fig. 14.



Valvata bicarinata.

Schuylkill River, west side, below Permanent Bridge. H. C. Lea. My cabinet. Diam. .30, length .12 inch.

In the form of the shell, this species closely resembles the *tricarinata*, Say. It differs in having but two carinæ, in having a wider umbilicus, and the spire is more depressed. The animals of the two species differ in form and color more than the shells.

The head of the *tricarinata* is more cylindrical and enlarged at the termination, where it somewhat resembles the snout of the hog, while that of the *bicarinata* is more conical and without so sudden an enlargement at the end. The color of the *bicarinata* is lighter. In the black markings they also differ. In the *tricarinata* there is a single blotch anterior to the area between the eyes. In the *bicarinata* this extends also behind this area; and in addition may be observed two quite black marks above the mouth, which the *tricarinata* does not seem to have. The tentacula of the *bicarinata* are larger and more filiform. When in motion, the anterior portions of the lobes of the foot are pointed, and recurved or hooked.

The shell of the *bicarinata* is quite light colored beneath, and rather a dark horn color above, the change of color taking place a short distance above the periphery of the whirl, between which and the superior carina it is quite dark. The superior carina is large and erect, the inferior one is smaller. All the whirls are visible beneath. Very minute longitudinal striæ cover the whole surface.

Having several living specimens of both these species, I observed them closely with a lens while under water in a glass vessel. On the 15th of May, while I had a *tricarinata* at the focus of my lens, I observed a small

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apple green, globose object, passing from under the aperture of the shell. This was shortly followed by others, and soon a transparent gelatinous mass became visible. This mass was passed slowly over the right side of the neck, under the pectiniform movable branchiæ, until entirely discharged against the perpendicular side of the vessel in which it was kept, and there the mass remained attached, the parent having abandoned it immediately. The time was fifteen minutes from the first appearance of the mass until it was fairly discharged. The green globules were the ova, of which I counted thirty in the transparent, globose gelatinous mass, which was not more in diameter than one-twentieth of an inch, the transverse diameter of the shell being about four-twentieths of an inch. In other cases, I found the number of ova to differ; some masses having only ten or twelve.

On the 23d (eight days after), the ova were so far advanced as to be changed to a dull faded green, the mass enveloping them having changed by degrees in transparency, and becoming of a slightly ferruginous color. As yet, no change of bulk or arrangement was observed.

On the 29th (fourteen days after), the mass was observed to be opened, and with a lens of considerable power I could plainly see a motion in most of the ova, the rounded form of the shell being easily discerned within.

On the 30th (fifteen days after), most of the young shells had broken their filmy bonds, only six or seven remaining: their motion was very apparent, and their minute black eyes could be plainly seen. I observed to-day, for the first time, that the *Valvata* has the power of swimming, inverted from the surface of the water, like the *Planorbes*, *Physæ*, &c. Most of the young were in that position, and could move comparatively fast. The action of the mouth in the adult, when swimming in this way, was constant, and changed from an oval to a circular form.

From the above observations, we may conclude that the *Valvata tricarinata* requires from fourteen to fifteen days to be perfected in the ovum, from the time it is ejected and abandoned by its parent. The *bicarinata*, I have no doubt, requires the same time. Numerous globules were deposited about the glass, which globules appeared all to resemble each other, and nearly all the individuals were of the species *bicarinata*. (*Lea.*)

Fig. 15.

V. carinata.

Valvata carinata, Sowb., l. c., is figured only; no description is given (fig. 15).

Valvata unicarinata, DeKay.—Shell small, apex depressed; whirls 3 or 4, impressed with minute incremental striæ, all flattened above and bounded by a revolving rib or keel, which in the younger individuals ascends to the summit: aperture circular, nearly vertical, scarcely modified by the keel; opercle corneous, thin, with concentric striæ; umbilicus wide, profound, exhibiting all the volutions; color milky bluish-white; apex often tinged with rufous. Height .1, diam. .15.

Fig. 16.

Valvata unicarinata.

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These dimensions are from one of the largest size, obtained from Lake Champlain, where they are very abundant, and from the Erie Canal. It is allied to the preceding (*V. tricarinata*), and forms the passage to *V. sincera*. Some eminent conchologists suppose this, and perhaps the following (*V. sincera*) to be mere varieties of *V. tricarinata*. It approaches the *V. humeralis*, Say, from Mexico; but it is smaller, not so much depressed, and has a wider umbilicus. (*DeKay.*)

I have evidence of its ranging at least from New England and Pennsylvania to Council Bluff and Methy Lake, lat. 57°.

Haldeman says the ova are deposited from the first day of March to the end of July, in transparent masses half a line in diameter, each containing a number of germs of a bright green color dotted with yellow.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8978	150+	Mohawk, N. Y.	Dr. J. Lewis.	.....
8979	1	Ann Arbor, Mich.	Prof. Winchell.	.....
8980	10	Milwaukee, Wis.	I. A. Lapham.	.....
8981	20+	Herkimer, N. Y.	Dr. Lewis.	vars.
8982	20+	Little Lakes, N. Y.	"	var. simplex.
8937	6	" "	"	" "
8941	5	" "	"	var. bicarinata.
8938	5	Burlington, N. J.	W. G. Binney.	.....
9058	50+	Grand Rapids, Mich.	Dr. Lewis.	.....
9059	100+	Schuyler's Lake.	"	.....
9060	100+	Mohawk River.	"	.....
9061	20	Little Lakes, N. Y.	"	.....
9293	2	Otter Tail Creek, Min.	R. Kennicott.	.....
9292	5	Great Slave Lake.	"	.....

Valvata sincera, Say.—Shell subglobose-conic; whirls nearly four, accurately rounded, finely and regularly wrinkled across; aperture not interrupted by the penultimate whirl, nor appressed to it, but merely in contact with it, the labrum not diminished in thickness at the point of contact; umbilicus large, exhibiting the volutions. Breadth less than 1-5 inch. Inhabits Northwest Territory.

Fig. 17.

V. sincera.

For this species I am indebted to Dr. Bigsby. It is very similar to the *tricarinata*, Nobis, but it is destitute of carinated lines and the umbilicus is rather larger; it differs from the *obtusa* of Europe also, in the much greater magnitude of the umbilicus. (*Say.*)

Valvata sincera, Say, Long's Ex. 264, pl. xv, f. 11; Binney's ed. p. 130, pl. lxxiv, f. 11.—Haldeman, Mon. p. 6, pl. i, f. 5–10.—Adams, Sh. of Vt. in Thoms. Vt. p. 152; Am. Jour. Sc. [1], XL, 267.—DeKay, N. Y. Moll. 119, pl. vi, f. 127, 128.

Valvata depressa, pars, Küster in Chemn. ed. 2, p. 88 (1852).—Menke, Zeit. für Mal. II, 122, 1845 (including *tricarinata* and *simplex*).

Valvata striata, Lewis, Pr. Phil. Ac. N. Sc. 1856, p. 260.

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The outline figure published by Say and copied in my figure 16 is not very satisfactory, nor have I ever seen specimens referred to this species which can easily be distinguished from ecarinate forms of *V. tricarinata.* Fig. 11 is a view of the animal copied from Haldeman. Kirtland quotes it from Ohio.

I give also a figure of a specimen of *V. striata* furnished by Dr. Lewis. I have no doubt of its identity with *V. sincera.* The name is preoccupied by Philippi, Enum. Moll., p. 157. Dr. Lewis' description is as follows:—

Valvata striata.—Shell conical, depressed, umbilicate; aperture round; epidermis brown and very regularly striate. Has all the other features of *sincera* except color and translucency. Animal not observed. Very rarely seen. Of several hundred specimens of *Valvata* only seven were this species. (*Lewis.*)

Fig. 18.

V. striata.

No. 8936 of the collection was labelled *V. sincera* by Dr. R. E. Griffith.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8935	3	Madison, Wis.	I. A. Lapham.	.....
8936	..	.....	Phil. A. N. S.	Cabinet series.
9296	2	Peace River.	.....	.....
9297	7	Upper Mackenzie R.	.....	.....
9294	13	Great Slave Lake.	Kennicott.	.....

Valvata pupoidea, Gould.—Shell small, elongate-ovate, opaque, chestnut-colored, when divested of the rough, dirty pigment which usually adheres closely to it; whirls four or five, minutely wrinkled, the posterior one small and flattened so as to form an obtuse apex; the others cylindrical, and so partially in contact as to expose about one-half of the cylinder; the last entirely disjoined from the preceding one for at least the half of a revolution; aperture circular, lip simple and sharp; on looking at the shell from below, no umbilical opening is found; operculum horny, apex central, elements concentric. Length .1, breadth 3-40 inch.

Fig. 19.

Valvata pupoidea.

Found at Fresh Pond and other ponds, on stones and submerged sticks; and has been for many years in our cabinets marked as a *Paludina.*

Animal very active; head proboscidiform, half as long as the tentacles, bilobed in front, dark, terminated with light; tentacles rather stout, light drab-colored, with a line of silvery dots on the upper side, over the large, black eyes; foot, tongue-shaped, as long as the first whirl, dilated into two acute angles in front, light drab-color; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its color, its elongated form, and its want of an umbilicus; of

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which characters the last two seem to arise from the loose manner in which the whirls are united. (*Gould.*)

Valvata pupoidea, GOULD, Am. Journ. Sc. 1st ser. XXXVIII, p. 196, 1840; Invert. of Mass. p. 226, f. 155; Otia, 180.—HALDEMAN, Mon. p. 10, pl. i, fig. 11-13.—DEKAY, N. Y. Moll. 119.—CHENU, Man. de Conch. II, 311, fig. 2230.—ANONYMOUS, Can. Nat. II, 214, fig.

Fig. 19 is an enlarged view of one of Dr. Gould's figures. Found also in Connecticut (*Linsley*), District of Columbia (*Girard*), Maine (*Mighels*), and Canada (*Can. Nat. i. c.*).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8993	5	Massachusetts.	Dr. J. Lewis.	.....
8992	3	"	W. Stimpson.	Cabinet series.

This species is made the type of a new genus *Lyogyrus*, by Mr. Gill. (Proc. Ac. Nat. Sci. Phil. 1863.) It does not appear to me that there are sufficient grounds for believing it distinct.

Valvata humeralis, SAY.—Shell subglobose, depressed; spire convex, not prominent; whirls three and a half, with the shoulder depressed, plane; wrinkled across, or rather with slightly raised lines; aperture appressed to the penultimate whirl, but not interrupted by it; umbilicus rather large. Greatest breadth, less than one-fifth of an inch.

Inhabits Mexico.

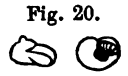
Differs from *V. sincera*, nob. of the Northwest Territory, in being more depressed, and in having a shoulder or plain surface near the suture. The umbilicus is larger than that of the *V. piscinalis*, Müll., and the spire more depressed; that species is also destitute of the depressed shoulder. (*Say.*)

Valvata humeralis, SAY, New Harm. Diss. II, 244; Descr. 22. BINNEY'S ed. p. 148.—HALDEMAN, Mon. p. 9.—MENKE, Zeit. für Mal. II, 129.

This Mexican species, not noticed since Mr. Say found it in Mexico, has been quoted from Canada by Bell, Whiteaves, &c. They probably refer to a variety of *V. tricarinata*. Compare *V. virens*.

Valvata virens, TRYON.—Shell turbiniform, consisting of four well rounded whirls; spire elevated, apex acute, sutures deeply indented; periphery almost angulated; umbilicus very wide; aperture oval or nearly round, the peristome merely touching the body above. Surface closely striate. Color varying from brilliant to dark-green. Height .5; diam. maj. .5, min. .4; of aperture, length 2.5, breadth 2 mill.

Fig. 20.



Valvata virens.

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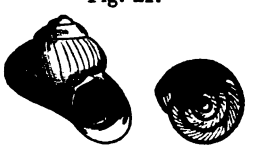
Clear Lake, California. Wm. M. Gabb. My cabinet, and cabinet of Mr. Gabb. A number of specimens of this species are before me, most of them being about two-thirds grown. It has no American[1] analogue. (*Tryon.*)

Valvata virens, TRYON, Proc. Phila. Acad. Nat. Sci. May, 1863, 148, pl. i, fig. 11.

I have added to the fac-similes of Mr. Tryon's figures (Fig. 20) an enlarged view of the shell and operculum of this species in Fig. 21.[2] The peculiar greenish color of the shell distinguishes it from the other American species. The description may be compared with that of *V. humeralis*, given above.

Fig. 21.



Valvata virens, greatly enlarged.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9803	3	Clear Lake, Cal.	G. W. Tryon, Jr.	Fig. 20.

SPURIOUS SPECIES.

Valvata arenifera, LEA, Tr. Am. Phil. Soc. IV, 104, pl. xv, f. 36; Obs. I, p. 114. On p. 27 of Vol. V it is said to be the larva case of *Phrygania*. Vide the interesting remarks by Von Siebold on this and similar sacs of Phryganidous and other insects in a paper "On a true Parthenogenesis in Moths, &c.," translated by Dallas, London, 1857, p. 28, note. See also CONRAD, N. Fr. Water Sh. p. 2.

Valvata cinerea, SAY, from Western States, is mentioned by name only by Wheatley in his Cat. of Shells of U. S., p. 29; also—

Valvata buccata, LEA, Schuylkill.

Valvata lustrica, MENKE, Syn. Meth. Moll. (Zeit. f. M. II, 130.)

FOSSIL SPECIES.

Valvata parvula, MK. and HDN., Phil. Pr. 1856, 123.

Valvata scabrida, MK. and HDN., Phil. Pr. 1860, 418.

Valvata subumbilicata, MK. and HDN. Phil. Pr. 1860, 430.

Planorbis subumbilicatus, MK. and HDN. (1856, 120).

---

[1] Eastern North American?

[2] The specimen figured was received from Mr. Tryon.

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FAMILY VIVIPARIDÆ.

Lingual membrane with seven series of teeth (3, 1, 3), the central teeth broader; simple or denticulated at their apices.

Fig. 22.

Lingual dentition of *Vivipara subpurpurea* (STIMPSON).

Rostrum simple, moderate; tentacles short, stout, the right hand one, on the male, as large as the rostrum; eyes on peduncles at their exterior base. Foot large, simple. Operculum annular, sometimes with a spiral nucleus. Shell spiral, turbinate, covered with an olivaceous epidermis; aperture simple in front.

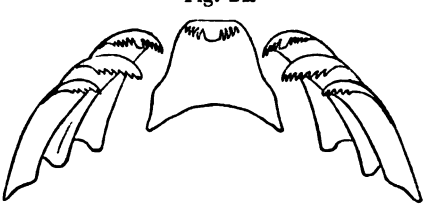
VIVIPARA, LAMARCK.

Foot of moderate size, thick, not produced beyond the snout. Colors very dark. Head rather large. Snout of moderate

Fig. 23.

Animal of *V. intertexta*. (Male.)

Fig. 24.



Lingual dentition of *V. intertexta*.

size. Lingual teeth armed with large denticles at their cusps; the central tooth with from seven (*swainsonii*) to eighteen (*sub-*

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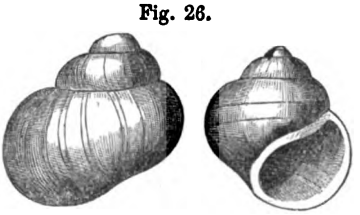
purpurea) denticles, the intermediate with from seven to twelve, the inner lateral with from five (*swainsonii*) to ten (*georgiana*), and the outer lateral with from five (*subpurpurea*) to sixteen (*bengalensis*). Right tentacle as broad as the snout, and but little shorter than the left, with its extremity truncated and excavated, forming a sheath for the reception of the connate male organ, which projects a little beyond when unsheathed or unfolded. Cervical lappets of each side very large, and folded, trough-shaped, forming with the mantle distinct tubular conduits, on the right side for the ingress, and on the left for the egress, of the water for respiration. Branchial laminæ very numerous, narrow, almost linear, and crowded in a single row, but variable in width at base, and diverging at their tips so as to appear to be in three or more rows. (*Stimpson.*) Operculum with the nucleus simple. Shell thin, turbinated, sometimes umbilicated; spire produced, whirls round, smooth or carinated, covered with an olivaceous epidermis; peristome thin, continuous, simple anteriorly.

Fig. 25.

Operculum of *V. georgiana.*

Vivipara intertexta, Say.—Shell subglobose, yellowish-green or brownish, wrinkled, and with minute, very numerous, obsolete revolving, deciduous lines; spire depressed conic, obtuse, truncated, eroded at tip; volutions nearly four; suture rather deeply indented; umbilicus closed by the lateral extension of the columella.

Fig. 26.



Paludina intertexta.

Greatest breadth, from four-fifths to one inch; length, about the same. Inhabits Louisiana.

We collected many of the shells in the marshes near New Orleans and on the banks of the Carondelet canal. It is remarkable for its globular form and for the numerous obsolete lines which seem like equidistant deciduous corrugations of the epidermis, having no effect whatever in modifying the calcareous surface, upon which it exhibits no trace. In good specimens two or three obsolete, pale bands are visible by transmitted light. (*Say.*)

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Paludina intertexta, SAY, 1829, New Harmony Diss. II, 244; Am. Conch. 3, pl. xxx, f. 3, 4, 1831; BINNEY's ed. p. 146, 185, pl. xxx, f. 3, 4; ed. CHENU, 42, pl. xi, f. 7—9.—HALDEMAN, Mon. p. 31, pl. x, f. 1—6, 1841.—DEKAY, N. Y. Moll. p. 85 (1843).—PHILIPPI, Conch. II, 8, pl. ii, f. 4 (1846).—KÜSTER, in Chemn. ed. 2, p. 16, pl. iii, f. 9, 10* (1852).

Paludina transversa, SAY, N. H. Diss. II, 245, 1829; BINNEY's ed. p. 145. —DEKAY, N. Y. Moll. p. 85 (1843).

Ampullaria (?) *intertexta*, HALDEMAN, Mon. Ampullaria, p. 11 (1844?).

In addition to Mr. Say's localities, I have received it from Grand Coteau, St. Laundry Parish, La. (*Blanc.*) Also from South Carolina (*Ravenel*), and from Davenport, Iowa (*Prof. Sheldon*). Very globose specimens of *Vivipara contectoides* sometimes are readily confounded at first glance with this species. They are umbilicated.

Fig. 27.

Vivipara intertexta.

Mr. Say's figures are copied above (fig. 26). Fig. 27 represents the front view of a more perfect specimen, No. 8863 of the collection.

Mr. Say's type of *Pal. transversa* is still preserved in the Cabinet of the Philadelphia Academy. It is evidently a young *intertexta*, as suggested by Haldeman. His description follows, with a view of his type (Fig. 28).

Paludina transversa, SAY.—Shell transverse, depressed, orbicular; spire convex; whirls three and a half, with numerous minute, slightly elevated revolving lines; suture not widely indented; body whirl very convex, short; umbilicus small; operculum pale fulvous. Greatest width, two-fifths of an inch. Inhabits Louisiana. We obtained two specimens in the marshes near New Orleans. It is much wider in proportion to the length than any other species I have seen, exceeding in this respect even *M. subglobosa*, nob., and especially *P. intertexta*, nob., of which latter, in fact, I at first supposed it to be the young, in consequence of its rotundity and the similarity of its capillary lines; but inasmuch as the number of its whirls is nearly the same, whilst the magnitude differs so greatly, I have separated it as a different species. (*Say.*)

Fig. 28.

Paludina transversa.

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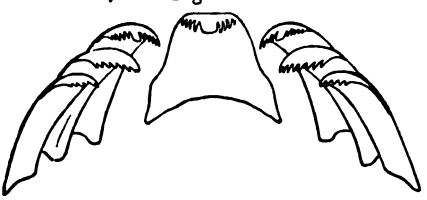
Fig. 29.

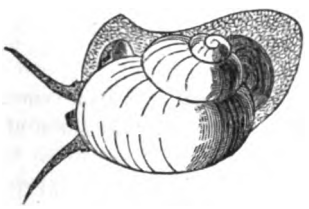


Lingual dentition of *V. intertexta.*

Fig. 29 represents the lingual dentition of *V. intertexta.* There are forty-eight rows of seven teeth each, the first fifteen or sixteen of a smoky claret color.

The male and female of this species are respectively represented in Figs. 31 and 30.

Fig. 30.



Female of *V. intertexta.*

Fig. 31.

Male of *V. intertexta.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8862	4	Grand Coteau, St. Laundry, La.	Rev. A. Blanc.	.....
8863	2	Grand Coteau, St. Laundry, La.	"	Figured.
8864	2	New Orleans.	Acad. Nat. Sc.	.....
9202	2	Illinois?	Gen. Totten.	.....
9305	..	Iowa—Davenport.	Prof. Sheldon.	Lingual ribbon—Fig.
9315	1	" "	"	Female. [29.
9316	1	" "	"	Male.

Vivipara subpurpurea, Say.—Shell oblong, subovate, olivaceous, with a tinge of purple more or less intense, sometimes hardly perceptible; spire rather obtuse, terminating convexly; whirls five, wrinkled, equally convex; suture impressed, but not very profoundly; aperture much widest in the middle, narrower above; within glaucous, somewhat perlaceous; labrum rectilinear from the middle upwards; umbilicus none. Length about one inch, greatest breadth four-fifths of an inch.

Fig. 32.

Pal. subpurpurea.

An inhabitant of Fox River, an arm of the Wabash. It is very distinct from any other species I have seen.

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The labrum exhibits no curvature from the middle almost to its junction with the penultimate volution.

Shell subglobular oval, not remarkably thickened; spire longer than the aperture, entire at the tip; whirls five, slightly wrinkled across, rounded but not very convex; penultimate volution somewhat elongated; suture impressed; aperture ovate-orbicular, less than half the length of the shell; labium with calcareous deposit; animal very pale bluish, with minute yellow points, particularly on the rostrum, tentacula, and prominent respiratory tube, which is as long as the tentacula; eyes on the exterior side of the tentacula, near the middle of their length; the anterior portion of the foot is very short.

Fig. 33.

Vivipara subpurpurea, young.

This species was first found by Mr. Lesueur and Dr. Troost, in Fox River of the Wabash. In the young state the figure is subglobose, and the aperture, although it hardly differs in form from that of the adult, is yet longer than the spire. They become proportionally more elongated as they advance in age, and the form, therefore, of the adult, is so different from that of the young or half grown, that in these states it may, very readily, be mistaken for a widely distinct species.

The color of the shell is variable. In some it is pale horn, more tinged with yellowish than with green; in others are traces of obsolete purplish bands; in many specimens the whole shell is reddish-purple, more or less obscure in different individuals.

Fig. 34.

V. subpurpurea. young.

In the autumn it is frequently found between the valves of dead Unios, in which it enters perhaps to hybernate. The species is certainly allied to the *vivipara*, but it cannot well be mistaken for it, as it is much less dilated, the volutions less convex; the penultimate volution is much longer in proportion to the length of the body whirl, and the umbilicus is obsolete. (*Say.*)

Paludina subpurpurea, Say, 1829; N. H. Diss. II, 245; Am. Conch. III, pl. xxx, f. 2, 1831; Binney's ed. p. 146, 185, pl. xxx, f. 2; ed. Chenu, 41, pl. xi, f. 6 —Haldeman, Mon. p. 28, pl. ix, 1841.—DeKay, N. Y. Moll. p. 86 (1843).—Küster, Chemn. ed. 2, p. 12, pl. ii, fig. 10–13; pl. vii, fig. 3–5.—Reeve, Con. Icon. 47, Feb. 1863.

Vivipara texana, Tryon, Pr. Ac. Nat. Sc. (fig.), Sept. 1862, p. 451.—Reeve, Con. Icon. 24 (Feb. 1863).

Mr. Say's original specimens of this species are still preserved in the collection of the Philadelphia Academy. Fig. 35 is taken from one of them.

The surface is often quite smooth and shining, the spire more or less elongated and slender, but generally distinguished by the penultimate whirl, which is very much larger than is usual in our

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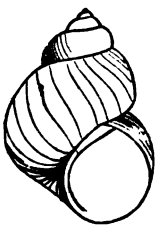
Viviparæ, and when seen from behind, appears remarkably bulging at its upper portion. The umbilicus is not always closed. Fig. 32 is copied from one of Mr. Say's figures. No. 9301 of the collection is figured in Fig. 36.

Fig. 35.



Vivipara subpurpurea.

In the description of the animal Mr. Say speaks of a tubular cylindrical organ as a respiratory syphon, but Haldeman suggests its being probably the outlet of the viscous glands.

A specimen in Mr. Anthony's cabinet measures in extreme length 33, last whirl 19, penultimate 8, antepenultimate 2½ mill., the measurements being taken on the front of the shell.

I have traced this species from Texas through Louisiana and Mississippi to Key West, Florida, and in the Western States of Indiana, Wisconsin, and Missouri.

Fig. 36.

Vivipara subpurpurea.

A more elongated, slender form of the species, which is common in the southwest, from Mississippi to Texas, has been described by Mr. Tryon as a distinct species under the name of *V. texana*. A careful examination of the specimen from which his diagnosis is drawn, as well as the large series in the Smithsonian collection, leaves no doubt in my mind of its identity. The original description and figure are given below. Reeve figures a much less characterized specimen of *V. subpurpurea* as *Pal. texana*, which he considers distinct.

Vivipara texana.—Shell solid, conic, light green colored; spire elongate, suture deeply impressed, apex obtuse; whirls 6, slightly convex; aperture small, suborbicular, equalling two-fifths the shell's length.

Fig. 37

Vivipara texana.

Texas. Coll. Acad. Nat. Sciences; Coll. G. W. Tryon, Jr.

Shell solid, narrowly conic, consisting of six whirls, which are somewhat flattened around the upper half of their breadth; suture well marked; aperture suborbicular, equalling two-fifths of the length of the shell; umbilicus covered; epidermis light green with faint red revolving bands.

This shell resembles most the *V. subpurpurea*, Say, but

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is easily distinguished by having six whirls, which are much narrower than in that species. The spire is also almost double the length of that of *subpurpurea*, and the epidermis of a lighter color. (*Tryon.*)

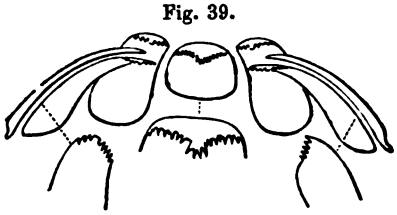
Fig. 38.

Operculum of *V. subpurpurea.*

Operculum horny, rounded; nucleus subcentral; lines of accretion concentric.

The lingual dentition of *V. subpurpurea* is shown in Fig. 39.

Fig. 39.



Lingual dentition of *Vivipara subpurpurea.* (STIMPSON.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8844	9	Natchez.	Col. Wailes.	.....
8845	13	Lake Concordia.	"	.....
8846	8	Mississippi River.	.....	.....
8847	4	.....	.....	Cabinet series.
9210	1	.....	.....	.....
9311	1	.....	W. G. Binney.	Fig. 36.
9314	2	.....	Agassiz.	Figured.

Vivipara multicarinata, HALD.—Shell conic, thin, subdiaphanous, green, whirls 5, longitudinally striate and transversely carinate.

Fig. 40.

Paludina carinata.

This *Paludina* is thinner and lighter than our species, and has but 5 whirls. The length is about one-fifth more than that of the last whirl, of which the diameter is about double that of the penultimate whirl; beside the longitudinal striæ, there are four carinas, of which the first and third are stronger than the second and fourth, and which cover the whole length of each of the whirls.

The opening is almost circular, yet the vertical is greater than the transverse diameter. The lip is slightly thickened, not acute; the columella, which is hardly distinct from the lip, joins the superior termination of the aperture under a slightly acute angle.

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The columella termination of the lip partially covers a very small umbilicus. The length of fully developed shell is 14, its-breadth 11 lines. (*Valenciennes.*)

Paludina carinata, VALENCIENNES, in Humboldt and Bonpland (1833), Rec. d'Obs. II, 252, pl. lvi, f. 2, *a b*.—KÜSTER, in Chemn. ed. 2, p. 28, pl. vi, f. 6, 7.—HALDEMAN, Mon. p. 27, pl. viii (1841).
Paludina multicarinata, HALDEMAN, Mon. pt. 4, p. 4 of cover (1842).

Figure 40 is a fac-simile of that of Valenciennes, whose description is copied above. Prof. Haldeman suggests the name *multicarinata*, as the name *carinata* has also been used by Swainson. I have seen no specimen of the species.

Vivipara contectoides.—Shell umbilicated, elongately-ovate, rather thin, smooth, shining, the surface scarcely broken by the extremely delicate lines of growth; greenish horn-color, sometimes darker, varied with several longitudinal dark streaks marking the former peristome, and with four well marked brown bands revolving upon the body whirl, of which two only are visible on the penultimate and antepenultimate; under the epidermis of a pale yellowish color, still plainly showing the bands; spire scalariformly turbinated, apex entire, well defined, obtuse; whirls 5, bulging, regularly and rapidly increasing in length, the last ventricose, more than one-half the shell's length, umbilicated; aperture sub-circular, oblique, about half as long as the body whirl, within white, showing plainly the four revolving bands, the lower one very near its base, none of them reaching the edge of the aperture; peristome dark, thin, acute, made continuous by the dark, thin, exserted callus which connects the terminations, somewhat reflected at the umbilicus.

Fig. 41.

Vivipara contectoides.

Fig. 42.

Operculum of *Vivipara contectoides.*

Length of axis 22, greatest breadth of last whirl 18; length of aperture 15, breadth 13 mill.

Operculum horny, concentric, thin, flexible, concave, the nucleus nearer the columellar margin (Fig. 42).

Limnæa vivipara, SAY, Nich. Enc. Am. ed. [1], pl. ii, f. 5 (1817) (*Paludina* of later ed.).
Paludina vivipara, SAY, Am. Conch. pl. x, outer figs. (1830); BINNEY'S ed. 49, 159, pl. lxx, f. 5; ed. CHENU, 17, pl. ii, f. 5, 5*a*.—HALDEMAN Mon. 17, pl. vi (1841).—DEKAY, N. Y. Moll. 86 (1843).

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Paludina linearis, KÜSTER, in Ch. ed. 2, 10, pl. ii, f. 6–9; p. 19, pl. iv, f. 4 (1852).

Helix vivipara, EATON, Zool. Text-Book, 196 (1826).

Has been found in Florida, Georgia, South Carolina, Alabama, Arkansas, Missouri, Illinois, Indiana, Michigan.

The specimen (Fig. 41) from which the above description is drawn is probably a male. It is the most scalariform of all that I have seen. The species is variable, the degrees of globoseness being numerous.

Fig. 43.

Vivipara contectoides, young.

Fig. 44.

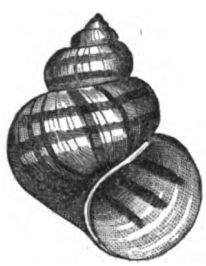
Vivipara contectoides, young.

The umbilicus is rarely entirely closed, even in young shells.

The number and disposition of bands is constant in all the specimens before me; the lower band sometimes is expanded so as to surround and enter the umbilicus.

The species is readily distinguished from *V. georgiana* by its perfect apex, by the greater globoseness of its whirls—they being more loosely convoluted, and by its more shining surface. Its epidermis is more delicate, and does not peel off like that of *georgiana*.

Fig. 45.



Vivipara contecta, Mill.

Fig. 46.

Vivipara vivipara, Lin.

Vivipara contectoides receives its name from its strong resemblance to the *V. contecta* of Europe. It has been by some authors considered identical with that species, and with the exception that the American form has four spiral bands upon the body whirl while the European is described as having but three, I can detect no specific differences between them. It is more upon its geographical distribution that I base my opinion of its being distinct. Our species is found over an area very much vaster than that inhabited by its European analogue. It is not one of the fluviatile species of the circumpolar or boreal regions, common to the three continents, as it is not found farther north than the great lakes. I am inclined to believe that, as with the exception of these circumpolar species the land and fresh-water

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molluscous fauna of Europe and America are entirely distinct, we are justified in considering that this *Vivipara* is not identical with the *V. contecta.*

There exist in Europe two species of *Vivipara:* the *contecta* (*Cyclostoma*), Millet, and *vivipara* (*Helix*), Lin. It is to the former that our species bears so strong a resemblance, and not to the *vivipara*, as suggested by authors. I have copied Reeves' figures of both species (Figs. 45 and 46) that those not having access to foreign works may compare them with our shells. *V. contecta* is described as being composed of 5½ prominently turned whirls, convoluted so loosely as to leave a deep umbilicus in the centre; while *V. vivipara* has one whirl less, has moderately ventricose whirls, and is more constrictedly convoluted—the umbilicus being reduced to a mere chink.

I have elsewhere remarked that *V. contectoides* seems, in respect to form, to hold the same relation to *V. georgiana* as *V. contecta* does to *V. vivipara.*

I have been unable to obtain living specimens of this species, or any preserved in spirits, from which to examine the lingual membrane.

Mr. Say first mentions this species as early as 1817, describing it as identical with the European *V. vivipara*, as a *Limnæa*, and later as a *Paludina.* I give below a copy of his description and figures from the American edition of Nicholson's Encyclopedia (Fig. 47), and the American Conchology (Fig. 48). It will be observed that Say mentions three revolving bands instead of four. I am inclined to attribute this to his overlooking the lowest band, which is quite at the base of the shell and does not extend so far towards the edge of the aperture on the inside.

Paludina vivipara, Say.—Shell subconic, with six rounded whirls; suture impressed, color olivaceous or pale, with three red-brown bands, of which the middle one is generally smallest, whirls of the spire with but two; aperture suborbicular, more than half the length of the shell.

It is doubtful whether or not this is the same as the *vivipara*, but it certainly approaches very near to it; we, however, refer it to that species until a specific difference can be indicated, which at present we are unable to do; the spire of this species is rather more obtuse, and the suture not so deeply impressed, as in the figures of the European specimens above mentioned. 14

Fig. 47.

Paludina vivipara.

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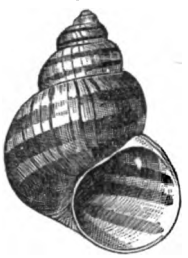
Donov. Brit. Shells, tab. lxxxvii, *Helix vivipara.*—Lister, Conch. tab. cxxvi, fig. 26; *Cochlea vivipara fasciata*, &c. &c.

This appears to be one of the many species that are common to North America and Europe. And though the specimens from the two continents differ a little, yet this difference is so slight as not to be specific. Cuvier remarks that "the female produces living young, which are found in its oviducts, in the spring, in every state of development. Spallanzani assures us, that the young, taken at the moment of their birth and nourished separately, reproduce without fecundation, like those of the *Aphis*. The males are nearly as common as the females; their generative organ is exserted and retracted, as in *Helix*, by a hole pierced in the right tentaculum, which causes this tentaculum to appear larger than the other. By this character the male is easily known."

Fig. 48.



Paludina vivipara.

The *vivipara* is far less common than the *decisa*, and seems to be more usually found in the southern part of the Union. Mr. Elliott of Charleston sent me two specimens from the banks of St. John's River, Florida, and Capt. Leconte presented me with one, which he obtained at Lake George on the same river. Pl. 10,[1] the two middle figures exhibit the brownish banded var. (*Say.*)

The next notice of the species was by Eaton, in 1826, who describes it as *Helix vivipara.*

In 1841 it is again described and figured by Haldeman, as identical with the European *Paludina vivipara.* The bands are spoken of as "several." Prof. Haldeman quotes *Pal. lineata* in the synonymy. (See that species).

The description of DeKay (1843) gives no additional information regarding the species, which is "extra-limital" to New York; it gives only four whirls and three bands to the shell.

In 1852, in the second edition of Chemnitz, this species is described and figured as *Paludina linearis.*

In the Proceedings of the Philadelphia Academy, 1862, p. 451, Mr. Tryon points out the fact of the American shell being invariably distinguished by the presence of four bands, yet refers it to *Pal. lineata*, Val., which derives its name from its being sometimes characterized by numerous revolving lines of green color instead of bands.

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[1] One of the figures is given in my figure 48.

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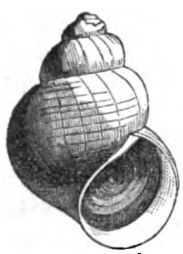
In 1863 Mr. Reeve refers the American form to *Paludina vivipara*, Lin.

Believing the species to be distinct from its European analogue, and not finding the description of Valenciennes to apply to it, I have been forced to adopt a new name, suggested by the resemblance of the shell to the *V. contecta* of Europe.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8849	1	Coosa River, Ala.	Dr. E. R. Showalter.	.....
8850	3	Lake Muxinkawka, Ind.	.....	.....
8851	4	Jacksonville, Fla.	W. G. Binney.	.....
8852	4	Georgia.	J. Postell.	Cabinet series.
8855	2	Illinois.	.....	.....
8856	2	Mississippi River.	.....	.....
8860	3	Indiana.	W. G. Binney.	.....
8861	4	St. Clair River.	.....	.....
9011	1	.....	.....	.....
	1	Florida.	Prof. Agassiz.	.....
9202	1	Tuscumbia, Ala.	Gen. Totten.	.....

Vivipara georgiana, Lea.—Shell scarcely rimate, elongately ovate, rather thick, smooth, lines of growth delicate; greenish horn-color, broken with darker longitudinal streaks and a few black ones showing the former peristomes, and whitish under the epidermis; sometimes of a rich brown color, pinkish without the epidermis, and varied with four revolving darker bands upon the body whirl, two of which only are visible above, and numerous irregularly crowded, narrow lines of the same color; spire elevated, composed of one entire and one partially truncated whirl, apex entirely removed; remaining whirls 4½, regularly increasing, convex, the last bulging, more than one-half the shell's length, rarely rimate; aperture subcircular, very oblique, more than half the length of the body whirl, within uniformly white or dark horn-color, or plainly showing the revolving bands, which do not reach the edge; peristome edged with black, simple, acute, continuous, its columellar margin exserted, somewhat reflexed, leaving a narrow fissure, connected with the upper termination by a shining, dark, raised callus. Length of axis 20, greatest breadth of body whirl 21; length of aperture 15, breadth 14 mill.

Fig. 49.



Vivipara georgiana.

Fig. 50.

Vivipara georgiana.

The operculum is thin, horny, brown, concentric with sub-central nucleus.

Fig. 51.

Operculum of *V. georgiana.*

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Paludina georgiana, LEA, Tr. Am. Phil. Soc. V, 116, pl. xix, fig. 85, date of title 1837; Obs. I, p. 228.—HALDEMAN, Mon. p. 23, pl. vii, f. 1, 2 (1841).—KÜSTER, in Chemn. ed. 2, p. 15, pl. iii, f. 7, 8 (1852) —DEKAY, N. Y. Moll. p. 86 (1843).—CHENU, Man. Conch. I, 310, fig. 2207 (Melantho); Illust. Conch. pl. i, f. 20, 21.—PHILIPPI, Conch. iii, 4, pl. i, f. 13 (1848).

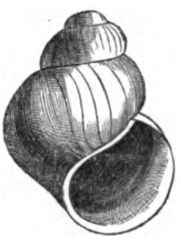
Paludina wareana, SHUTTLEWORTH in KÜSTER, Chemn. ed. 2, 21, pl. iv, f. 10–11.—REEVE, Con. Icon. 23 (1863).

Vivipara vivipara (part), W. G. BINNEY, proof-sheets of this work.

Inhabits Florida, Georgia, South Carolina, and Alabama.

Mr. Lea's description of this species will have to be considerably modified to cover the various forms now known to exist; it was drawn from a specimen which was uniformly dark horn-colored. Specimens in the Smithsonian collection are thus characterized, while others are of an uniform pale greenish horn-color; others (Fig. 53) have a dark-green or brownish ground, varied with four broad brownish bands revolving on the body whirl, two only of which are discernible on the penultimate whirl; in others these bands are replaced by numerous revolving, unequal brown lines (Fig. 54). Those having the revolving lines have also bands which, as in the other cases, are plainly visible in the aperture of the shell. The bands do not reach the edge of the peritreme in the aperture; they are still discernible when the shell has lost its epidermis. As the peritreme rises to meet the base of the body whirl it is expanded and reflected, sometimes leaving a chink forming a false umbilicus—the shell being imperforate.

Fig. 52.



Paludina georgiana.

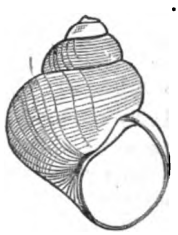
I have not been able to trace any revolving microscopic lines upon the specimens I have examined.

No. 8854 of the collection was determined by Mr. Lea. His description is given below, and an outline of his original figure. Fig. 52 is copied from Haldeman's figure, which was drawn from the original specimen. The other figures are from specimens in the collection.

Fig. 53.

Vivipara georgiana.

Fig. 54.



Vivipara georgiana.

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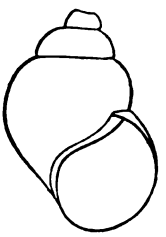
Paludina georgiana, LEA.—Shell ventricose-conical, thin, dark horn-colored, smooth; sutures very much impressed; whirls about five; convex; aperture nearly round, white.

Hopeton, near Darien, Ga. Prof. Shepard; my cabinet; cabinet of Prof. Shepard. Diameter .7, length 1.1 inch.

This species in form resembles most, perhaps, the *P. vivipara*. It is not quite so large, nor has it bands. It is rather more elevated, and the body whirl is smaller and rounder than the *P. decisa*, Say. The aperture at the base recedes more than is usual with the genus. (*Lea.*)

Fig. 55.



Paludina georgiana.

Vivipara georgiana is not a variable species in form. It bears somewhat the same relations to *V. contectoides*, as the European *V. vivipara* does to *V. contecta*. It is more constrictedly coiled upon its axis, its spire is more pyramidal in shape, its whirls are more flattened, and less angularly bulging at their upper portion. It is constantly truncated at the apex.*

Reeve places *Pal. georgiana*, together with *vivipara*, Say, in the synonymy of the European *vivipara*, as I did in the proof-sheets of this work. The specimens since received have caused me to change my opinion.

An examination of an authentic specimen of *Pal. wareana* leaves no doubt in my mind of its identity with *V. georgiana*. The original description and a fac-simile of one of the original figures here follow:—

Paludina wareana.—Shell rimately perforate, ventricose, rather thin, subopaque, with delicate concentric lines, olivaceous-ferruginous, thickly streaked with smoke color; whirls 4, inflated, sutures deep; aperture oval, white, ends joined by a thin, glassy callus; peristome straight, sharp.

Fig. 56.

Shell somewhat resembling *Pal. obtusa*, but is very truncated, rimate, perforate, ventricose, rather thin and transparent, almost opaque; striæ fine; color olive green blending with iron; surface broken by numerous curved streaks, sometimes linear, sometimes stronger; whirls 4, slightly increasing; first whirl entirely eroded, the second slightly so in the shell examined; whirls ventricose, sutures moderate; aperture ovate, much shorter than the spire, above modified by the penultimate whirl, reddish within, bluish towards the edge; parietal wall covered with a thin transparent callus; columellar slightly curved; peristome straight,

Paludina wareana.

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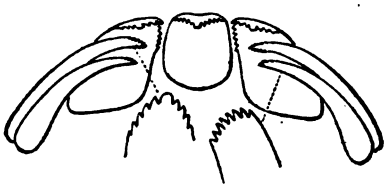
acute, from below the middle to the base slightly curved. Length 9‴, breadth 7‴.

East Florida, in Lake Ware (Rugel). Coll. Charpentier (*Shuttleworth*).

The lingual membrane of *Vivipara georgiana* is figured below.

Fig. 57.



Lingual membrane of *Vivipara georgiana*. [STIMPSON.]

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8853	1	Georgia.	.....	.....
8854	3	"	.....	.....
8857	1	Alabama.	Acad. Nat. Sc.	.....
8958	2	Darien, Geo.	"	.....
8959	1	South Carolina.	"	.....
9012	1	.....	.....	Figured.
9022	1	Florida.	.....	"
9023	1	Georgia.	.....	"
9300	1	Florida.	L. Agassiz.	" [Figured.
9304	..	.....	"	Lingual of 9300.

Vivipara lineata, VALENCIENNES—This species resembles that of the Seine. It is equally ventricose, but has a thinner shell. Shell ventricose-ovate, thin, diaphanous, with delicate transverse striæ; greenish horn-color, with numerous transverse greener vittæ. Whirls five, last one large, ventricose, and equalling in height one-half the entire length of the shell. Besides the striæ of growth, there are numerous transverse, very fine lines. The whirls are not flattened towards the moderate suture. Apex acute. Color green, sometimes somewhat corneous ground, on which are a large number of bands of a deeper green and variable width, sometimes merely linear. On the upper whirls the bands are obsolete. Apex not eroded in any of a large number of individuals.

Operculum brown, thin, horny, covered with numerous concentric, not spiral, lines. Found in Lake Erie by M. A. Michaud, who found one shell full of young, as in the case of our species, which proves the species to be viviparous. There is reason to believe the other species also are so, though in the most natural genera species vary in being both oviparous and viviparous. The genera of colubers and vipers among the reptiles are an example of this, while the Mollusca furnish more numerous ones.

Length 1 inch 3 lines. (*Valenciennes.*)

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Paludina lineata, VALENCIENNES, Rec. d'Obs. II, 256, 1833.

I have translated above the original description of Valenciennes. I have never seen any specimen to which it will apply, but have no doubt such will be found. At present it remains a doubtful species.

It is referred to *Pal. vivipara*, of Say, by several authors, but all the specimens of that species which I have seen are not characterized as *V. lineata* is described as being. (See remarks under *V. contectoides.*)

Vivipara troostiana, LEA—Shell ventricose-conical, thin, pellucid, yellowish horn-color, smooth, perforate; spire short; sutures very much impressed; whirls four, convex; aperture large, rounded, white.

Tennessee. Prof. Troost. My cabinet, and cabinet of Prof. Troost. Diam. .68, length .72 inch.

This is a subglobose species, differing from any which has come under my notice, in having the superior portion of the last whirl somewhat flattened, giving the shell a somewhat gibbous appearance. The operculum is rather of a light color, and the plane of the aperture is very retuse at its base. It has a strong resemblance to *P. unicolor* (Lamarck), and perhaps a stronger one to *P. Maheyana* (Grateloup). It is more depressed in the spire than either, and the perforation is smaller than in the former, while it is nearly the size of that in the latter. The aperture is larger than either. Dr. Grateloup has very properly, I think, separated the Malabar species from that which was observed by Olivier in Egypt, and called *unicolor* by Lamarck. The Egyptian shell has a larger perforation, is darker in color, and is a larger species. I call this after my friend Prof. Troost. (*Lea.*)

Fig. 58.

Vivipara troostiana.

Paludina troostiana, LEA, Tr. Am. Phil. Soc. IX, 14 (1844). Obs. IV, p. 14. Proc. II, 34 (1841). Arch. f. Nat. 1843, II, 130.

Paludina haleiana, LEA, l. c. X, 96, pl. ix, f. 58 (1847). Obs. IV, 70. Proc. IV, 167 (1845).

I have added to Mr. Lea's description of *V. troostiana* a view of the type (Fig. 58) in his collection. It will not seem to correspond very exactly with the figure of *haleiana*, of which a fac-simile is given below (fig. 59). A comparison of all of Mr. Lea's specimens of each has convinced me, however, of their identity. Mr. Lea's description of the latter species here follows.

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Fig. 59.

Paludina haleiana.

Paludina haleiana, LEA—Shell smooth, ventricosely conical, rather thin, reddish horn-color, imperforate; spire short; sutures much impressed; whirls four, nearly convex; aperture large, nearly round, bluish.

Diameter .4, length .55 inch. Alexandria, La.

This species is nearly allied to the *Pal. troostiana*, nob., but is rather smaller, of a darker color, not quite so rotund, and imperforate. These differences would distinguish it without difficulty. In the *haleiana* there is a disposition in most of the specimens to a compression below the sutures. This makes quite a shoulder at the sutures and prevents the mouth from being regular. (*Lea.*)

Vivipara coosaensis, LEA—Shell subglobose, thin, pale, rather smooth, perforate; spire short; sutures very much impressed; whirls five, round; aperture large, nearly round, within whitish.

Fig. 60.

Vivipara coosaensis.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith and Dr. Foreman. Diam. .58, length .62 inch.

This species is remarkable for its round whirls, its width and large deep sutures. The superior part of the whirls is somewhat flattened. The color is remarkably pale, nearly white. The epidermis is very thin, and under the lens displays very minute, rather regular longitudinal striæ crossed on the body whirl by obsolete striæ. The aperture is nearly one-half the length of the shell. (*Lea.*)

Paludina coosaensis, LEA, Tr. Am. Phil. Soc., IX, p. 23 (1844). Obs. IV, 23. Proc., II, 83 (1841).—REEVE, Con. Icon. (Feb. 1863).

Paludina magnifica, pars., HALDEMAN, Mon., pt. 6, p. 4 of wrapper.

Mr. Lea's type of this species bears but little resemblance to *V. magnifica*, yet Prof. Haldeman unites the two. I myself have seen no connecting links between them, though I have examined numerous young individuals of *Viv. magnifica.*

Fig. 60 is drawn from the original specimen of Mr. Lea. No. 8949 of the Smithsonian collection was labelled by Mr. Lea.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8949	..	Alabama?	.....	Teste *Lea.* Cab. series.

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TULOTOMA, Haldeman.

Soft parts of the animal, and lingual dentition unknown. Operculum with the nucleus simple. Shell thick, pointed-conic, imperforate; whirls flattened, nodulous, carinated, with a dark olivaceous epidermis; peristome thin, continuous.

Fig. 61.

Operculum of *Tulotoma magnifica*.

Tulotoma magnifica, Conrad—Shell subovate, ventricose, with two spiral bands of prominent tubercles on the body whirl, and one revolving near the base of each whirl of the spire; suture profoundly impressed, margined by an obtuse, subnodulous, prominent line; lines of growth very oblique and prominent; obscure spiral striæ; epidermis olive; within bluish, often with purple bands.

A beautiful species when perfect, occurring in vast abundance on the masses of calcareous rock, which have fallen from the strata above into the Alabama River at Claiborne. I found it living only in such situations, and exclusively within a range of six or eight miles. In the Tombeckbee or Black Warrior Rivers, I never observed a specimen of it, although I searched particularly for it on the rocks at St. Stephen's. (*Conrad.*)

Fig. 62.

Paludina magnifica.

Paludina magnifica, Conrad, N. Fr. W. Shells, 1834, p. 48, pl. viii, fig. 4; ed. Chenu, 23, pl. iv, f. 21.—DeKay, N. Y. Moll. (1843), p. 86.—Küster in Chemn., ed. 2, 1852, p. 23, pl. v, figs. 3-6.—Philippi, Conch., III, 1, pl. i, figs. 1, 2 (1848).—Müller, 1838, Syn. test. anno 1834, promulg. 39.—Reeve, Con. Icon. xx, f. 54 (1863).

Paludina bimonilifera, Lea; Tr. Am. Phil. Soc., V, 58, pl. xix, fig. 71, date of title, 1837.—Ib., Obs. I, 170.—DeKay, N. Y. Moll. 87 (1843).

Paludina angulata, Lea; Tr. Am. Phil. Soc., IX, 22 (1844).—Ib., Obs. IV, 22. Proc. II, 83 (1841).

Tulotoma, Haldeman, Mon. I, Suppl. 2.

Operculum horny, subtriangular, with a lateral nucleus and concentric striæ. A continuous elevated, heavy, revolving line sometimes takes the place of the nodules. The interior of the aperture varies from pure white to a rich dark purple; it is sometimes of a salmon color; the bands are also very variable in number and width. There are also sometimes dark-green

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bands on the exterior of the shell. I have counted as many as four on the body whirl alone. It is variable in size, and is generally much eroded at the apex. One specimen which I measured was 50 mill. long.

Fig. 63.

Operculum of *Tulotoma magnifica.*

It inhabits Alabama and Georgia.

Fig. 64.

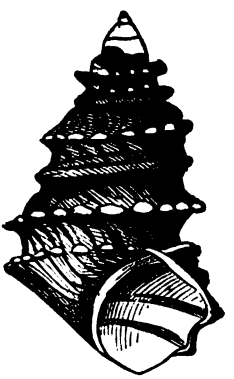
Tulotoma magnifica.

Fig. 62 is a fac-simile of the outline of Conrad's figure of *Paludina magnifica.* I have added below figures of Mr. Lea's *Pal. bimonilifera* and *Pal. angulata,* which are, I believe, identical with this species, Fig. 66 being a fac-simile of Mr. Lea's figure, and Fig. 67 being taken from a specimen determined by Mr. Lea. No. 8928 of the collection was labelled *Pal. angulata* by Mr. Lea. Haldeman agrees with me in considering this last identical with *T. magnifica.* I am indebted to Dr. E. R. Showalter for the other specimen figured. Haldeman adds *Pal. coosaensis* to the synonymy.

Fig. 65.

Tulotoma magnifica, young.

Fig. 66.



Paludina bimonilifera.

Paludina bimonilifera, LEA—Shell obtusely turreted, dark horn-color; apex obtuse; whirls furnished with two rows of nodules; the nodules of the lower row of the upper whirls hidden by the suture, those of the upper row larger, and visible on all the whirls; sutures deep and irregular; outer lip sub-biangular; base sub-angular.

Alabama River (Judge Tait). My cabinet and those of Prof. Vanuxem, Am. Phil. Soc., Ac. Nat. Sc. Phila., P. H. Nicklin, Baron Ferussac. Diam. 1.1, length 1.8 inches.

This superb *Paludina*, which far surpasses in point of beauty any of our species yet known, I owe to the kindness of Judge Tait. Its beautiful double tuberculated cincture at once distinguishes it from all described species. Some specimens are furnished with dark purple bands which beautifully decorate the interior of the shell, and give a dark rich green color to its fine epidermis. In the others these are wanting, and the epidermis then has a clear and more yellow appearance. The sutures being

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formed immediately over the lower row of tubercles, they cause its line to be very irregular; and this row itself is hidden on the upper whirls. (*Lea.*)

Paludina angulata, LEA—Shell inflated, thin, brown, above somewhat varicose, below transversely and minutely striate, minutely perforate; spire rather short, dark at the apex; sutures impressed; whirls five, angular in the middle; aperture large, subtriangular, within subrubiginous.

Fig. 67.

Paludina angulata.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, Dr. Foreman, T. G. Lea, and J. Clark. Diam. .80, length 1.05 inch.

This is a very distinct species, being more angular than any I have seen. In the specimen before me, there are three irregular transverse impressions, two above the angle, and one immediately below. The striæ are more distinct on the lower half of the whirl. The first three whirls are very dark. The aperture is nearly one-half the length of the shell, and quite angular at the base.

Since the above was written, I have received more mature and perfect specimens. They differ from the one described in being darker in the epidermis, and in having four purple broad bands, which are very distinct within the aperture. In these specimens, there is a series of indistinct tubercles above the periphery of the last whirl. (*Lea.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8927	1	Alabama.	.....	Teste T. A. Conrad. Cabinet series.
9017	1	"	I. Lea.	(*P. angulata.*) Figured in Fig. 67.
8928	5	"	.....	*angulata* teste Lea.
9150	20+	Coosa River.	.....	..... [Cab. ser.
9196	2	Alabama River.	Dr. Showalter.	.....

MELANTHO, BOWDITCH.

Fig. 68.

Melantho decisa (female).

Foot large, rather thin, broad, much produced beyond the snout, and slightly auricled in front. Colors rather light, in reddish spots on a palish white ground. Head of moderate size. Snout small. Lingual teeth smooth, or only very mi-

Fig. 69.

Lingual dentition of *M. integra*

nutely crenulated at their apices. Cervical lappets of moderate size, but not forming regular tubular aquiferous ducts; the right one plicated. Branchial lamina elongate-triangular, equal in size, and arranged in a single straight row both at base and tips. (*Stimpson.*) Operculum with the nucleus simple.

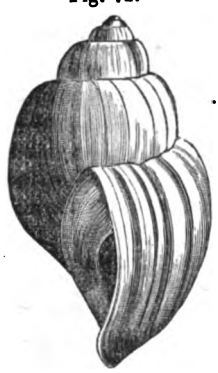
Fig. 70.

Operculum of *M. decisa.*

Shell thick, solid, ovate, imperforate, spire produced; whirls rounded, smooth, covered with an olivaceous epidermis; peristome simple, continuous.

Melantho ponderosa, Say—Shell imperforate, globosely-ovate, very thick and heavy, smooth surface hardly broken by the wrinkles and delicate striæ of growth, often also with delicate revolving striæ; greenish horn-color, with irregularly disposed dark streaks, marking the edges of former peristomes, milky white under the epidermis; spire short, conic, apex perfect, convex; whirls 5 or 6, very rapidly increasing in length, convex, the body whirl very large, equalling four-fifths the shell's length, imperforate; aperture oval, narrowed above, slightly oblique, equalling almost one-half the shell's length, within white, shining; peristome margined externally with darker color, simple, acute, extremely sinuous, in its first half rectilinear, then produced forward and rounded, then retreating rapidly and curving inwards and downwards, thence upwards to the base of the aperture, its columellar portion very much thickened, sometimes exserted sufficiently to leave a narrow fissure, connected with the upper terminus by a very thick and solid callus, which enters beyond sight within the aperture, and at the upper portion is produced into a prominent Lithasia-like thickening, between which and the peristome is a deep sinus. Length of the axis 33, greatest breadth of body whirl 27; length of aperture 28, greatest breadth 19 mill.

Fig. 71.



Melantho ponderosa.

Operculum elongate-ovate, narrow above, convex, margin thin, horny, concentric, nucleus near the columella.

Paludina ponderosa, Say, 1821, J. A. N. S. II, 173; Am. Conch. III, pl. xxx, f. 1 (1831); ed. Binney, p. 68, 184, pl. xxx, f. 1; ed. Chenu, 41, pl. xi, f. 5.—Haldeman, Mon. p. 13, pl. iv (1840).—De Kay, N. Y. Moll. p. 86 (1843) (exc. syn. *heterostropha*).—Deshayes in Lam. ed. 2, VIII, p. 516 (1838); ed. 3, III, p. 453, excl. *P. decisa.*—Küster in Chemnitz, ed. 2, p. 14, pl. iii, f. 1–4, p. 20, pl. iv, fig. 6.—

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Sowerby, Gen. of Shells, f. 2.—Chenu, Man. de Concl. I. 310, fig. 2206 (Melantho); Illust. Conch. pl. i. f. 14–15; Lec. Elem. d'Hist. Nat. p. 171, f. 559, 560(1847).—Philippi, Conch. III, 3, pl. i, f. 6(1848).

Ampullaria crassa, Deshayes, Encycl. Méth. II, 32 (1830).

Paludina crassa, Say of Deshayes l. c.

Paludina decisa (part), Reeve, Con. Icon. f. 45 *b*.

Paludina regularis, Lea, Tr. Amer. Phil. Soc. IX, 13 (1844); Obs. IV, 13; Proc. II, 34 (1841); Arch. f. Nat. II, 130 (1843).—Reeve, Con. Icon. pl. xi, f. 69 (1863).

I have received specimens from Ohio, Indiana, Illinois, Michigan near Lake Superior, Tennessee, and Alabama.

There are microscopic revolving lines upon the whirls of many specimens, and the callosity at the superior angle of the aperture is sometimes developed sufficiently to make quite a fissure between it and the lip, as in *Lithasia*. This is an important feature which serves to distinguish it from the allied species, as does also the highly developed curvature of the peristome (see Fig. 71), the extreme thickness of the shell, the heavy, deeply entering callus on the parietal wall of the aperture, the shorter spire, and more globose outline of the shell. It appears to me a distinct species, readily distinguished from *M. decisa* and *M. integra*, in early stages of growth as well as when mature—the young shells being very much more globose than the young of those species.

Fig. 72.

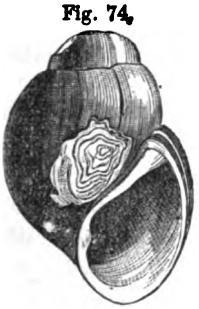
Melantho ponderosa, young.

Fig. 73.

Melantho ponderosa, young.

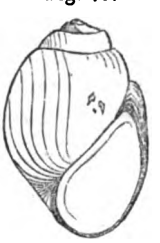
From the Coosa River, in Alabama, Dr. Showalter has sent numerous specimens of this species, which were formerly noticed by Prof. Haldeman as var. a. They are extremely solid. have the callosity of the upper portion of the aperture highly developed, are constantly truncated in the early as well as later stages of growth, and when mature are very much eroded even upon the body whirl They have the usual features of *M. ponderosa*—

Fig. 74.



Melantho ponderosa.

Fig. 75.



Melantho ponderosa.

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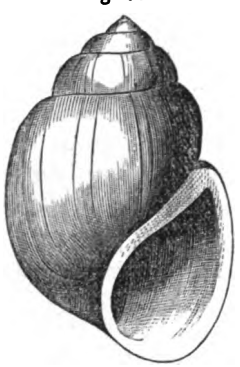
the sinuous peritreme, the revolving striæ, the short spire, the heavy callus upon the parietal wall of the aperture. Some of them are figured in Fig. 72 to 75.

I give below the original description of Mr. Say, and a facsimile of one of his figures (Fig. 76). The shell figured as *Pal. decisa* in the American Conchology may, perhaps, be a form of *M. ponderosa.* (See Fig. 84.)

Paludina ponderosa, SAY.—Shell somewhat ventricose, much thickened, olivaceous or blackish; spire not much elongated, much shorter than the aperture, eroded at tip, but not truncated; whirls five, slightly wrinkled across; suture profoundly impressed; aperture subovate, more than half the length of the shell; labium with much calcareous deposit, and thickened into a callosity at the superior angle; within tinged with blue.

Fig. 76.



Paludina ponderosa.

Inhabits Ohio River.

Greatest length, one inch and 11-20. Transverse diameter one inch and 1-10.

This shell is common at the falls of the Ohio, and is a very remarkably thick and ponderous species. It bears a striking resemblance to *P. decisa*, and has, without doubt, been generally considered as the same; but it differs from that species in being much more incrassated and heavy; and although much decorticated and eroded upon the spire, the tip is not truncated. In the labrum also is a distinctive character; by comparison this part will be perceived to be less arcuated in its superior limb than the corresponding part in *decisa.*

This shell is common in many parts of the Ohio as well as its tributaries. In its full grown state it is very thick and ponderous, enlarging so much in its body whirl, as to appear very different from the young shell. In the early stages of growth it resembles *P. decisa*, Nobis, from which indeed the back view would hardly distinguish it; but a sufficiently distinctive character resides in the lower part of the labium, which in the *decisa* is not obviously produced, whereas in the present species it is considerably advanced, as in many species of *Melania*, to which genus it is closely allied. (*Say.*)

I have no doubt that a young specimen of *Melantho ponderosa* is the type of *Paludina regularis*, Lea. My figure is drawn from a specimen determined by him, and now deposited in the collection of the Smithsonian Institution (No. 9016). The spire

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is extremely short, flattened, but well defined quite to the acute apex; the sutures are impressed; the body whirl comprises more than five-sixths of the complete length of the shell; the aperture is almost as long as the body whirl, and so wide that the length and breadth of the shell are almost equal; the shell is remarkably globose, almost circular. I have often met in cabinets with immature specimens of *Viv. ponderosa* under this name. No. 8925 were also labelled *regularis* by Mr. Lea. His description here follows. The shell figured under this name by Reeve appears to me a young *M. ponderosa.*

Fig. 77.

Paludina regularis.

Paludina regularis, LEA.—Shell subglobose, rather thick, greenish horn color, imperforate; spire very short; sutures impressed; whirls five, convex; aperture large, ovate, within bluish.

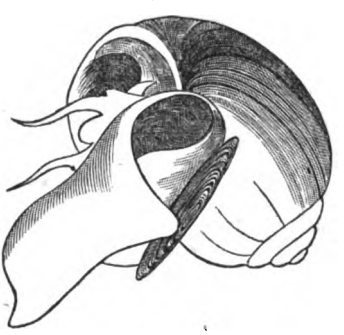
Ohio? T. G. Lea. My cabinet, and cabinet of T. G. Lea. Diam. .38, length .52 inch.

A very distinct species with the body whirl about four-fifths the length of the shell. The whirls are very regular, giving the spire somewhat the appearance of a coil of rope. All the specimens before me are more or less incrusted with the oxide of iron. The aperture is inflated, and about three-fourths the length of the shell.

I am not positively sure that this species came from Ohio. By some accident the label has been misplaced, but I am under the impression it came with some other species from my brother at Cincinnati. (*Lea.*)

Ampullaria crassa, of Deshayes, is a synonym of this species, as will be seen by the translation given below of Deshayes' description. He quotes erroneously *Paludina crassa*, of Say, for the species—Mr. Say never having published this name. An examination of the animal has, moreover, shown it to belong to the genus *Melantho.* Fig. 78 is taken from a drawing of the animal by Mrs. Say, which Prof. Haldeman furnished me.

Fig. 78.



Animal of *Melantho ponderosa.*

Ampullaria crassa.—Shell ovate-elongate, acute, thick, solid, under the epidermis brownish; very white; transversely substriate; whirls 6, con-

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vex, scalariform, separated by a deep and channelled suture; aperture ovate acute, expanded at base, very white within, and with a small umbilicus.

Paludina crassa, SAY.

We do not agree with Mr. Say in placing this shell among the *Paludinæ:* it has not their essential characters, excepting the lengthening of the spire. In other respects it is more nearly allied to the *Ampullariæ*, its form and thickness particularly approaching some of the fossil species of the environs of Paris described below.

This shell is oval, elongated, acute at the summit, rounded at base, thick, solid, heavy, covered with a brownish, sometimes greenish very thin epidermis, below which the shell is of an uniform milky white pureness. The spire is elongated, conic, scalariform, formed by six convex whirls, deeply separated by a canaliculated suture, and, in perfect specimens, marked with delicate transverse striæ. The aperture is moderate, not oblique to the shell's axis or rounded or with a continuous peritreme like *Paludina*, but oval, narrowed above where it also is angular as in most *Ampullariæ*, enlarged below, where it forms a large, not deep sinus, in this point also resembling *Ampullaria*, but differing from all *Paludinæ;* lastly, the right lip is slightly reflected (recouvrant), which is also characteristic of the genus in which we have placed it. Right lip acute, quickly thickening but with no rim within, sinuose, especially at base, when viewed in profile; left lip thickened, especially towards the posterior angle of the aperture, and obliquely appressed so as to blend with the columella which is rounded, thick, and reflected, with a small umbilical opening behind it. This shell comes from the Ohio and most of the North American rivers. Length from 45 to 50 mill. (*Deshayes.*)

Reeve, *l. c.*, places *Paludina ponderosa* in the synonymy of *Pal. decisa.* It is, indeed, difficult to draw the line between the two.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8841	3	Coosa River, Ala.	W. G. Binney.	.....
8842	1	" "	"	.....
8843	2	....	"	.....
8818	3	Ohio.	Acad. Nat. Sc.	Cab. series.
9152	2	Alabama.	.....	.....
9332	9	Coosa River, Ala.	Showalter.	.....
9333	12	" "	"	.....
8925	6	Illinois.	.....	*regularis*, teste Lea.
8926	4	"	I. Lea.	" [Cab. ser.
9016	1	.....	.....	.....

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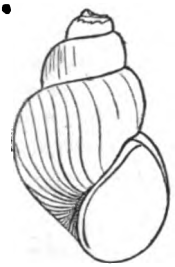
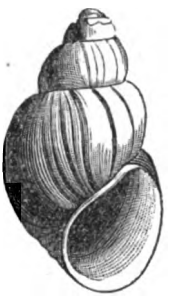
Melantho decisa, SAY.—Shell imperforate, elongate-ovate, rather thick, smooth, surface hardly broken by lines of growth, with microscopic revolving striæ; greenish, with irregularly disposed brown streaks marking the edge of former peristomes, uniformly chalky white under the epidermis; spire truncated, one or two whirls of it alone remaining, apex entirely removed; remaining whirls 3½, convex, the last equalling two-thirds of the shell's length, imperforate; aperture oval, oblique, more than one-half the length of the last whirl, bluish-white within; peristome externally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin callus on the parietal wall, entering within the aperture. Length of axis 37, greatest breadth of body whirl 17; length of aperture 16, breadth 11 mill.

Fig. 79.



Melantho decisa.

Fig. 80.



Melantho decisa.

Fig. 81.

Melantho decisa.

Operculum arcuated, convex, horny, concentric, nucleus nearer the columellar margin.

Fig. 82.

Operculum of *Melantho decisa.*

Limnæa decisa, SAY, Nich. En. ed. 1, 1817; ed. 2, 1818, pl. iii, f. 6.

Paludina decisa, SAY, 1817, Nicholson's Encycl. pl. iii, f. 6 (*Limnæa* of earlier editions); Amer. Conch. I, pl. x (1830); ed. BINNEY, p. 49, 159, pl. x, fig. 1, pl. lxx, fig. 6; ed. CHENU, 16, pl. ii, f. 5.—PHILIPPI, Conch. III, 3, pl. i. f. 8 (1848).—HALDEMAN, Mon. p. 4, pl. i (1840).—GOULD, Invert. of Mass. 227, wood-cut, p. 144 (1841).—ADAMS, in Thompson's Hist. of Vermont, p. 151, fig. (1842).—DEKAY, N. Y. Moll. p. 84, pl. vi, f. 131; vii, 134 (1843).—CHENU, Ill. Conch. i, f. 1–5.—MRS. GRAY, Fig. Moll. An. pl. cccx, f. 10.—POTIEZ et MICHAUD, Gall. des Moll. I, 247, pl. xxv, f. 13, 14.—KÜSTER in Chemn. ed. 2, p. 13, pl. ii, fig. 14–19.—REEVE, Con. Icon. 45, *a*, *c*, *d*, excl. 45 *b* (= *Pal. ponderosa*), Mar. 1863.

Melania ocularis, MENKE, Syn. Meth. p. 134, teste KÜSTER.

Paludina limosa, VALENCIENNES, Rec. d'Obs. II, p. 253, 1833, teste KÜSTER and HALDEMAN.

Paludina ponderosa jun., DESHAYES in LAM. VIII, 516 (1838), ed. 3, III, 455.

Paludina heterostropha, KIRTLAND, Ohio Rep. p. 175 (1838).—TAPPAN, Am. Journ. Sc. [1], XXXV, p. 269, pl. iii, p. 2, 1839.

Paludina microstoma, KIRTLAND, Ohio Report, p. 175 (1838).

Paludina rufa, HALDEMAN, Mon. III, p. 3 of wrapper, pl. iii, f. 1 (1841).

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Paludina cornea, VALENCIENNES? Rec. d'Obs. II, 255, 1833.

Paludina integra, SAY, 1821, BINNEY's ed. p. 69; Journ. A. N. Sc. II, 174 (1821).—HALDEMAN, Mon. p. 10, pl. iii (1840).—ADAMS, in Thomp. Vermont, p. 152 (1842).—DEKAY, N. Y. Moll. p. 84, pl. vii, f. 132 (1843).—KÜSTER, Chemn. ed. 2, p. 17, tab. iii, f. 11–13.—CHENU, Ill. Conch. pl. i, f. 9–13.—PHILIPPI, Conch. III, 4, pl. i, f. 7 (1848).

Paludina genicula, CONRAD, N. Fr. W. Shells, p. 48, pl. viii, fig. 3, 1834; ed. CHENU, 23, pl. iv, f. 20.—KÜSTER in Chemn. ed. 2, p. 14, pl. iii, fig. 5, 6 (1852).—MÜLLER, Syn. Test. in 1834 prom. p. 39.—HALDEMAN, Mon. p. 15, pl. v (1840).—DEKAY, N. Y. Moll. p. 86 (1843).—CHENU, Illust. Conch. pl. i, f. 18–19.

Paludina heros, DEKAY, olim, N. Y. Prel. Rep. 1839, p. 32; Moll. p. 85 (1843).

Paludina subsolida, ANTHONY, Proc. Ac. N. Sc. Phila. 1860, p. 71.—TRYON, Phil. Pr. 1862, 452.

Paludina decapitata, ANTHONY, Proc. A. N. S. Phila. 1860, p. 71.—REEVE, Con. Icon. pl. xi, f. 75 (1863).

Paludina milesii, LEA, Proc. Phila. Acad. Nat. Sc. 1863, 156.

Helix dissimilis, WOOD, Ind. Suppl. pl. vii, f. 18 (1828); HANLEY's ed. p. 226 (1856).

Helix decisa, EATON, Zool. Text-Book, 196 (1826).

Lymnula ventricosa, RAFINESQUE, MSS.

Ambloxis (*Amblostoma*) *major*, RAFINESQUE, MSS.

Cochlea Virginiana, &c., LISTER, Conch. t. cxxvii, f. 27 (1770).

PETIVER, Gazophyl. t. cxvi, f. 18.

Found in all eastern North America, from the Rio Grande to Nova Scotia and the Canadas.

The first point to be decided in considering this species is what shell Mr. Say had before him in drawing up the description of *Limnæa decisa*, which name was subsequently changed to *Paludina decisa*. It is from the original description and figure alone that this point can be decided. They are both copied below, as given in the American edition of Nicholson's Encyclopedia.

Limnæa decisa, SAY.—Shell subconic, olivaceous, truncated at the apex; whirls four, wrinkled across and banded with minute distant striæ; terminal whirl very short; suture impressed and conspicuous; aperture subovate, more than half of the length of the shell, entire; within bluish-white. Operculum coriaceous, elevated on the disk and concentrically striated. Length one inch, breadth three-fourths.

Fig. 83.

Limnæa decisa.

Cochlea virginiana é flava viridescens, non fasciata. LISTER, Conch. tab. cxxvii, fig. 27.

The young shell resembles *P. subcarinata*, but the whirls

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are destitute of an elevated line, the suture is not so deeply impressed, and the aperture is narrower above.

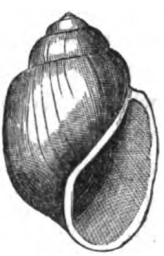
Animal with the foot larger, suddenly a little dilated each side before and truncate in front, widely; foot livid, thickly maculated with irregular orange spots, which are much smaller beneath; head and tentacula spotted with orange; eyes on a prominent angle, at the external base of the tentacula.

I found the animal viviparous in October; the young shell had then three complete whirls, which were spirally striated. (*Say.*)

In the above description no locality is given, but there can be no doubt that the shell described is the form common in the Delaware River. I have, therefore, taken this form to be the type of the species. From one of these my description and figures 79 and 81 are drawn. Younger specimens are proportionally more globose than the one figured, and the spire is often not truncated, but consisting of 5 whirls, the apex being perfect. Fig. 80 is drawn from a specimen found in the Susquehanna, more elongated in shape, and truncated at the apex alone. In New England and Canada the shell is less elongated, with more pyramidal spire.

Say figured another shell as *Paludina decisa* in the American Conchology, and gave two figures of it, from one of which my figure 84 is copied. At this time he repeated the description from the Encyclopedia, and added the following remarks and references.

Fig. 84.



Paludina decisa.

This species is common in various parts of the Union. Dillwyn informs us that Müller and others have incorrectly quoted Lister's figure for their *Helix angularis*. *Petiver*, Gaz., pl. 106, fig. 18. (*Say.*)

The figure copied above does not agree with that given in Nicholson's Encyclopedia. I should rather refer it to *Melantho ponderosa* (page 37).

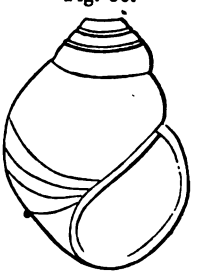
Fig. 85.

Helix dissimilis.

To the typical form of *M. decisa* the following synonyms may without doubt be referred.

Figure 85 is a fac-simile of *Helix dissimilis*, Wood, of which no description nor locality is given. It is evidently intended for this species, though the true name *decisa* is

Fig. 86.



Cochlea, &c., Lister.

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applied by Wood to a figure of *subcarinata*. I also give a facsimile (fig. 86) of Lister's figure.

Paludina heterostropha of Kirtland's Ohio Report is referred by Gould (Boston Proc. 1, 32) to *Mel. ponderosa*. Judging from the figure given of it by Tappan, I would rather refer it to *decisa*. It is so considered by Reeve. This figure is copied in my fig. 87, while the description furnished Tappan by Dr. Kirtland is as follows:—

Fig. 87.

Paludina heterostropha.

Paludina heterostropha, KIRTLAND, l. c.—Sinistral; aperture more than half the length of the shell. Shell subglobose, ovate; spire depressed, apex generally truncate; whirls 5; aperture ovate, with its superior extremity curved towards the body whirl, within bluish-white; epidermis greenish horn color, usually coated with ferruginous clay. Length ¾ inch.

This shell frequently occurs in Mill and Yellow Creeks, tributaries of the Mahoning River. I formerly considered it a mere variety of *P. decisa*, Say; but on further examination found it to be specifically distinct. It never attains more than half the length of that species; its spire is never depressed, and it is always heterostrophal. (*Tappan.*)

To the copy of the description of *Paludina decapitata*, of Mr. Anthony, given below, I am able to add Fig. 88, drawn from the type, which he kindly loaned me for the purpose. I do not consider this a well-established species. The single specimen on which it is founded is evidently an undeveloped specimen in a very imperfect state. The spire is eroded, the shell presents the appearance of belonging to a small ill-favored individual of *M. decisa*. However, the only information we have regarding it, given below, may serve to identify it, should it appear in future.

Paludina decapitata, ANTHONY.—Shell globular, thin, of a light green color; spire truncate, but never elevated under any circumstances, composed of about four very flat whirls; aperture broad, ovate, one-half the length of the shell, within dusky white; columella regularly but not deeply rounded, with a slight deposit of callus, and having a very small linear umbilicus at base.

Fig. 88.

Paludina decapitata.

Tennessee. My Cabinet.

A single specimen only is before me, and therefore I claim it as a new species with some hesitation; it seems to me, however, too unlike any of the ordinary forms in this genus to warrant its being included with any of them; it is the most globose of any species hitherto published, if we except the small, round forms which were long since removed, and very properly too, to

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Amnicola; the spire is entirely wanting, but traces of the sutures show the number of whirls; and its present appearance forbids the idea of its ever having had an elevated spire. (*Anthony.*)

The fac-simile which I have given of Haldeman's figure, drawn from the original specimen of *Paludina genicula*, Conrad (Fig. 89), would lead one to consider that species identical with *Viv. decisa*. I do not, therefore, hesitate to unite them; my opinions are founded on an examination of a series of shells from the locality which furnished Mr. Conrad's specimen, which show a gradual series from the rounded whirls of the *decisa* to the angular form of *genicula*, though none of the shells were as well marked as that figured. From other localities, also, I have received specimens of *decisa* whose six whirls were quite as angular and scalariform. I suppose Higgins refers to some such in quoting *Pal. genicula* from the Ohio and Scioto Canal (Cat. 6). In Küster's Paludina (Chemn. ed. 2), Cedar Creek is also given as a locality for *genicula*. Mr. Conrad's description is as follows. Fig. 90 is a fac-simile of his. It is considered identical with *decisa* by Reeve.

Fig. 89.

Paludina genicula.

Fig. 90.

Paludina genicula.

Paludina genicula.—Shell suboval, spire slightly elevated; volutions 4, scalariform, shoulders angulated; apex eroded, aperture rather more than half the length of the shell; epidermis green olive; within bluish.

A species which is readily distinguished from those nearest allied to it by the angulated whirls. I found a single specimen in Flint River, Ga. (*Conrad.*)

Lymnula ventricosa, Rafinesque, of whose description and figure (fig. 91) a copy is here given, is evidently this species. His figure, though very rough, is quite characteristic.

Fig. 91.

Lymnula ventricosa.

Lymnula ventricosa.—Whirls 4, last one very large; form obtuse-oval; aperture bluntly oval, &c. (*Rafinesque.*)

Fig. 92.

Lymnea eburnea, Raf.

From the same MS., "Conchilogia Ohioensis," which was presented to the Smithsonian Inst. by Prof.

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Haldeman, I find rough figures (fig. 92) of *M. decisa* under the name of *Ambloxis*, *Amblostoma*, or *Lymnulus major*, Rafinesque, or *Lymnea eburnea*, Rafinesque. All these names are given, and I find it impossible to decide which was the one finally fixed upon, or to decipher more of the description than the following :—

Whirls 5, last very large, form obtuse oval, aperture obtuse oval, lip thickened within, columella covered with callus. (*Rafinesque.*)

I put *Melania ovularis*, Mke., in the synonymy on the authority of Küster (Chemn. ed. nov.), who so quotes it. I have seen no authentic specimen, but cannot doubt its identity with *M. decisa*.

Melania ovularis, MENKE, (l. c.)—Shell ovate-conoid, truncate, substriate, shining, greenish, reddish-brown when old, truncated at apex; aperture ovate, columella subcallous above; aperture rounded before.

Length 1 inch; breadth 7 lines.

Hab.—Near Cincinnati, in the Ohio River. Beseke. (*Menke.*)

Paludina limosa, Valenciennes, is considered a synonym of *M. decisa* by Haldeman and Küster. I have seen no authentic specimen. It is also considered a synonym by Reeve, *l. c.*

Paludina limosa, VALENCIENNES (l. c.)—Shell ovate-conic, thin, subdiaphanous, green; whirls 5, longitudinally striate; labrum acute.

Paludina limosa, SAY, Journ. Phil. I, 125.

This *Paludina* is less globose and longer than that of our climate. The height at the last whirl is a little less than of the others. Its breadth is greater than its length, and its surface is covered with somewhat strong longitudinal striæ. The form of the aperture is also more oval. Its vertical diameter is the longest.

The lip is sharp, continued to the columella, which is not appressed.

The shell is not very thick; there are, however, some individuals which are eroded like some of the bivalve shells.

The apex is destroyed as the animal grows, and a flat circular partition is formed, having the axis of the shell in its centre, in about the same manner as in *Bulimus decollatus*.

I saw one individual whose three apical whirls were destroyed so as to give a broken appearance to the shell.

Length rather more than one inch. (*Valenciennes.*)

The following also is cited as a synonym of *M. decisa* by Reeve. Judging from the description I should so consider it.

Paludina cornea, VALENCIENNES (l. c.)—In the Delaware and many other rivers of the United States there is found a horn-colored *Paludina*, which at first sight resembles the *Pal. limosa*, but which a more careful examina-

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tion proves to be sufficiently distinct to form a new species. On account of its color I call it

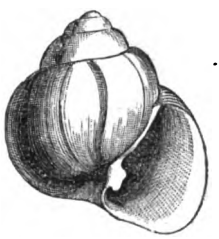
Paludina cornea.—Shell ovate-conic, thin, opaque, greenish horn color; whirls 5, subrounded; sutures deeply impressed.

This species has an obtuse apex; the last whirl is one-third longer than the others; each of them has a kind of flattening (aplatissiment) which forms a balustrade (rampe) around the spire, whose sutures are deeply impressed. The striæ of growth are vertical and fine. The aperture is oval. Horn colored, with a greenish tinge; the interior of the mouth and lip is white.

The largest individual was 11 lines in length. (*Valenciennes.*)

Figure 93 represents a deformed specimen of *Melantho decisa*, from the Susquehanna. It is introduced here for the purpose of showing how abnormal an individual of a species may be.

Fig. 93.



Melantho decisa, deformed.

Another abnormal form of *Melantho decisa*, in which the whirls are more numerous and tapering, which is often met with in any large number of specimens, has been described as a distinct species as *Paludina milesii.* The original description is given below, as well as a figure of one of the original specimens, presented by Prof. Miles.

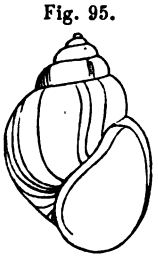
Fig. 94.

Paludina milesii.

Paludina milesii.—Shell smooth, subpyramidal, subsolid, imperforate; spire lengthened; sutures deeply impressed; whirls 6, subinflated; aperture somewhat small, subovate; labrum acute, somewhat sinuose; columella somewhat thickened both above and below.

Branch Lake, Antrim Co., Michigan. M. Miles. (*Lea.*)

Fig. 95.



Paludina obesa.

No. 8921–4 of the collection were presented by Dr. James Lewis under the unpublished name of *Paludina obesa*, Lewis. Fig. 95 represents one of them. This form is a well marked variety, found near Mohawk, N. Y., in Ohio, and Michigan. It is readily distinguished by its very ventricose, rounded form and dark olive green color. Its name is preoccupied.

It is customary, in collections, to separate the more elongated forms of *Melantho decisa* under the name of *M. integra.* It becomes necessary, therefore, to ascertain what shell Mr. Say had before him in drawing up the description of *Palu-*

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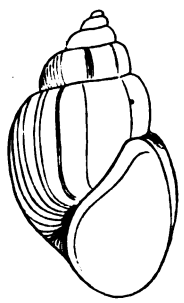
dina integra. I have, therefore, copied below his description, and given a figure (96) of his typical specimen still preserved in the collection of the Philadelphia Academy.

Paludina integra, SAY.—Shell olivaceous, pale, conic; whirls six, wrinkled across; spire rather elongated, entire at the apex; suture profoundly indented; aperture subovate, less than half of the length of the shell.

Fig. 96.



Paludina integra.

Inhabits the waters of the Missouri. Length ¼ inch.

Very much resembles *P. decisa;* the spire, however, is more elongated, and never truncated at the apex, but always acute. (*Say.*)

The dimensions given above are probably a typographical error.

The large number of specimens which I have had the opportunity of examining have exhibited so many and so slight degrees of difference between *M. decisa* and *M. integra*, that I am persuaded of their specific identity. I am supported in this view by the recent monograph of Mr. Reeve, but opposed in it by most of the American collectors. I have given below a description and figure of what is usually acknowledged to be *Paludina integra.* The difference of form of the sexes is shown also, Fig. 98 being male, Fig. 97 being female.

Melantho decisa, var. *integra.*—Shell imperforate, elongate-ovate, quite thick, smooth, surface hardly broken by lines or wrinkles of growth, marked with delicate revolving striæ; greenish, with darker streaks, marking the edge of former peristomes, uniformly chalky white under the epidermis; spire elongated-conic, apex perfect, acute; whirls 5, convex, the last equalling two-thirds the shell's length, imperforate; aperture oval, narrowed above, oblique, more than half the length of the body whirl, milky white within; peristome externally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin, transparent callus on the parietal wall of the aperture,

Fig. 97.

Female of *M. decisa*, var. *integra.*

Fig. 98.

Male of *M. decisa*, var. *integra.*

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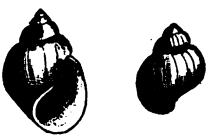
more heavily thickened and white above and below. Length of axis 24, greatest breadth of body whirl 15; length of aperture 15, breadth 11 mill. Operculum as in *M. decisa*.

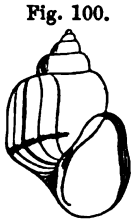
In general terms it may be said that the form known as *M. integra* differs from *M. decisa* by being more elongated, having a perfect apex, a smaller aperture, more prominent revolving striæ, and a whiter aperture. These characters are only comparative. The two forms are not distinguished by any decided, constant, specific characters. Fig. 99 represents young shells, which are more globose, comparatively, than the more mature ones.

Fig. 99.



Young of *M. integra*.

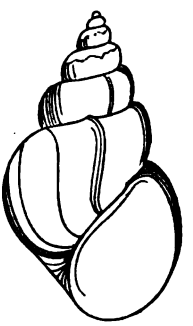
Fig. 100.



M. integra, deformed.

Two curiously deformed specimens of *M. integra* in the collection are figured in Figs. 100 and 101.

Fig. 101.

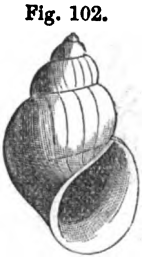


M. integra, deformed.

Reeve places *Paludina ponderosa* in the synonymy of *Pal. decisa*. On page 37 will be found an enumeration of the constant specific characters of *Melantho ponderosa*.

Paludina microstoma, Kirtland, is added to the synonymy on authority of Mr. Anthony, who tells me Prof. Kirtland described it before meeting with the description of *integra*. On seeing Mr. Anthony's cabinet he was at once convinced of their identity.

Fig. 102.



Paludina rufa.

Paludina microstoma, l. c.—An undescribed species of *Paludina*, found frequently associated with the *P. decisa*, and distinguished by its elongated spire and small mouth. (*Kirtland.*)

Paludina rufa, Haldeman, is said by him (l. c.) to be distinguished by a reddish color and entire apex, but may be a variety of *Pal. decisa*. The reddish or pinkish tint within the aperture (sometimes divided into bands) appears to distinguish this form of the species, which occurs in the Southern as well as Northern States. Prof. Haldeman's original specimen of *Pal. rufa*, together with all those from which

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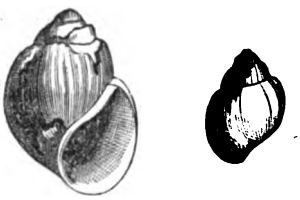
the plates of his Monograph were drawn, are deposited by him in the collection of the Academy at Philadelphia. Fig. 102 is a facsimile of the figure referred to by Haldeman under this name. No. 8905 of the collection represents it. This variety is represented by eight of the lots catalogued below in the museum register. One of them has the spire truncated, the surface very much eroded, a more globose form, and more sinuous peritreme than usual (see Fig. 103). The whole shell under the epidermis appears of a rosy hue.

Fig. 103.

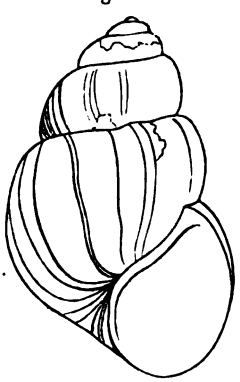


M. integra, var. *rufa*.

Paludina subsolida, Anthony, appears to me also a synonym of this species. My opinion is founded on an examination of Mr. Anthony's specimen, kindly lent me for figuring (Fig. 104). It is also so considered by Reeve. No. 9311 was presented to the collection under this name by Mr. Anthony. His description here follows.

Paludina subsolida, Anthony.—Shell ovate, imperforate, very thick; color light green, verging to brown in old specimens; spire much elevated, composed of 6—7 inflated whirls; sutures very distinct; aperture broad-ovate, about one-third the length of the shell, within white; lip curved forward and forming a very conspicuous, subacute tip near its base; columella well rounded, a thick callous deposit covering the umbilicus. Length 2 inches, breadth 1¼ inches.

Fig. 104.



Paludina subsolida.

Illinois. My cabinet; cabinet of Hugh Cuming, London.

This is the most ponderous species in the genus, far exceeding *P. ponderosa*, Say, in that respect; compared with that species it is not only much more solid and heavy, but its spire is proportionally more elongate, whirls more convex, while the body whirl is less ventricose, and the aperture is uncommonly small for a *Paludina* of its size; the body whirl is disposed to be angulated near its middle; all the whirls are more or less shouldered and the lines of growth are very conspicuous; the body whirl is obscurely striate concentrically, and its surface thereby modified so as to present a faintly sculptured appearance, and the striæ being somewhat finely undulated the appearance under a microscope is very pleasing. (*Anthony.*)

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Paludina heros, DeKay, of one of the earlier Zoological Reports of New York is said by that author to be a large form of *Pal. integra*. (N. Y. Moll. p. 85.)

Fig. 105 represents the lingual dentition of *M. integra*. Lingual membrane composed of forty-eight rows of teeth, arranged in the form common to the group 3, 1, 3. Central tooth broad, short, and hooked, a small shoulder each side near its base; first lateral broad and hooked; second and third lateral long, claw-shaped; anterior part of membrane broad, narrowing toward the middle, and again widening at its posterior portion. First twelve or fourteen rows translucent brown in color, the rest colorless.

Fig. 105.

Lingual dentition of *M. integra*.

The animal of this species is given in Fig. 68, p. 35.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8876	3	.....	W. G Binney.	Cabinet series.
8877	1	.....	Dr. J. Lewis.	"
8878	4	.....	W. G. Binney.	"
8879	6	Burlington, N. J.	....	"
8880	1	Blue River, K. T.	Dr. J. G. Cooper.	.....
8881	3	Massachusetts.	W. Stimpson.	.....
8882	4	Nimahaw River, K. T.	Dr. J. G. Cooper.	.....
8883	4	New York—Erie Canal.	Dr. J. Lewis.	.....
8884	7	Grand Rapids, M.	"	. ....
8885	3	N. Illinois.	R. Kennicott.	. ...
8886	4	Erie Canal, N. Y.	Dr. J. Lewis.	.. ..
8887	3	"	"	.....
8888	2	"	"	.....
8889	2	"	"	.....
8890	7	Quasqueton, Iowa.	E. C. B.	.....
8891	3	Jerseyville, Ill.	.....	.....
8892	1	Big Sioux.	Dr. F. V. Hayden.	.....
8893	2	Milwaukee, Wis.	I. A. Lapham.	.....
8894	6	Sangemon River, Ill.	D. H. Roberts.	.....
8895	4	Mohawk, N. Y.	Dr. J. Lewis.	.....
8896	7	Illinois.	W. G. Binney.	.....
8897	7	Miss. River.	.....	.....
8898	1	Maryland.	A. N. S.	. ...
8899	2	Maine.	"	.....
8900	2	Greenwich, N. Y.	Dr. Ingalls.	.....
8901	6	Texas or Alabama.	W. G. Binney.	.....
8902	2	Big Prairie Creek, Ala.	Dr. Showalter.	.....
8903	3	New York.	Dr. Lewis.	Revolving bands.
8904	5	Batavia, Ill.	W. G. Binney.	.....
8905	3	Grand Rapids, Mich.	Dr. Lewis.	(*Pal. rufa*, Hald.)
8906	7	E. Georgia.	Dr. Jones.	.....
8907	1	Vermont.	Acad. N. Sc.	.....
8908	8	Buffalo, N. Y.	Nasons.	.....
8909	7	Alabama.	.....	.....
8910	10	Burlington, N. J.	W. G. Binney.	.....
8911	1	Alabama.	.....	.....
8912	9	Hiram, O.	.....	.....
8913	1	Elyria, N. Y.	.....	.....
8914	10	.....	.....	.....
8915	10	Athens, Ga.	.....	(*Pal. rufa.*)
8916	2	Aztalan, Wis.	S. F. Baird.	.....
8917	3	Schuyler's Lake, N. Y.	Dr. J. Lewis.	.....
8918	4	Racine, Wis.	S. F. Baird.	.....
8919	2	Texas.	W. G. Binney.	.....

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8920	507	Mohawk, N. Y.	Dr. J. Lewis.	(*P. rufa.*)
8921	6	Grand Rapids, Mich.	"	*P. obesa*, Lewis.
8922	2	Columbus, O.	"	"
8923	1	Ohio.	"	"
8924	2	"	"	" Cab. ser.
9018	1	New York.	"	.....
9021	1	Delaware River.	W. G. Binney.	.....
9029	1	Coosa River.	"	.....
9027	30+	Grattan, Mich.	Dr. J. Lewis.	.....
9028	7	Reed's Lake, Mich.	"	.....
9029	200+	Grand River, Mich.	"	.....
9030	250+	Michigan.	"	.....
9031	300+	Brest, Mich.	"	.....
9032	50+	.....	"	.....
9033	100+	Mohawk, N. Y.	"	.....
9034	20+	Grattan, Mich.	"	.....
9035	900+	.....	"	.....
9036	20+	Mohawk, N. Y.	"	.....
9037	100+	"	"	.....
9038	50+	"	"	.....
9039	7	Erie Canal, N. Y.	"	.....
9040	11	"	"	.....
9041	9	"	"	.....
9042	12	Mohawk River.	"	.....
9043	13	"	"	.....
9044	4	Erie Canal.	"	.....
9045	10	Mohawk River.	"	.....
9046	12+	Erie Canal.	"	.....
9047	9	Mohawk River.	"	.....
9048	6	Canal, Mohawk.	"	.....
9049	6	"	"	.....
9050	10	Grand Rapids, Mich.	"	.....
9051	7	Grattan, Mich.	"	.....
9052	11	Grand Rapids, Mich.	"	.....
9053	7	Erie Canal.	"	.....
9054	3	.....	"	.....
9055	100+	Mohawk, N. Y.	"	.....
9151	20+	.....	.....	.....
9155	2	Owasco Lake.	Mrs. H. W. Parker.	.....
9153	3	Cayuga Lake.	"	.....
9157	..	.....	.....	.....
9197	7	Lynn, Mass.	Dr. Prescott.	.....
9198	1	Schuylkill.	Gen. Totten.	.....
9199	3	South Carolina.	"	.....
	5	Santee Canal.	Ravenel.	.....
9330	..	.....	.....	.....
9334	9	Arkansas.	.....	.....
9311	1	.....	L. Agassiz.	.....

Melantho coarctata, LEA.—Shell imperforate, ovately turreted, thick, the surface decussated by revolving striæ and lines of growth; light greenish horn color, with darker longitudinal streaks marking the margins of former peristomes, white under the epidermis; spire elongated, apex entire; whirls 6, regularly increasing, slightly convex, the last one equalling more than one-half the shell's length, imperforate, sometimes compressed and obtusely carinated; aperture

Fig. 106.

Melantho coarctata.

Fig. 107.

Melantho coarctata.

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scarcely oblique, ovate, longer than wide, more than half the length of the body whirl, within white; peristome simple, acute, sinuose, its margins not on the same plane, its terminations connected by a heavy shining callus upon the parietal wall. Length of the axis 22, greatest breadth of body whirl 15; length of aperture 15, breadth 9 mill.

Paludina coarctata, LEA, Tr. Am. Phil. Soc., IX, 30 (1844); Obs. IV, 30; Proc. II, 243 (1842).—REEVE, Con. Icon. 46 *a* (Feb. 1863).

Paludina lima, ANTHONY, Proc. Acad. N. S. Phil. 1860, p. 70.—REEVE, Con. Icon. 46 *b* (Feb. 1863).

Paludina exilis, ANTHONY, Proc. Acad. N. S. Phil. 1860 p. 71.

Paludina compressa, LEWIS in *Sched.* (Unpublished.)

It has been found in South Carolina, Alabama, Mississippi, and Arkansas.

The striæ of growth, very much decussated by revolving deep cut lines, distinguish all the forms mentioned in the synonymy, and constitute one of the chief characteristics of the species. In form it seems capable of some considerable variation, being, at times, very slender and elongate, at others much more ovate, with more globose whirls.

I give below a copy of Lea's description, and a drawing of his original specimen (Fig. 108).

Having before me the original specimens of *Pal. lima* and *exilis*, kindly loaned me by Mr. Anthony, and one determined by Mr. Lea to be his *Pal. coarctata*, I cannot hesitate in uniting them under one specific name, which, of course, will be the earliest published. No. 8867 of the Smithsonian collection is also a specimen of the same, though presented by Dr. J. Lewis under the unpublished name of *Pal. compressa*, Lewis.

Mr. Lea has enabled me to figure his original specimen (Fig. 108). I am able also to add figures of the shells from which Mr. Anthony drew his description of *Pal. lima* (Fig. 110) and *exilis* (Fig. 109). The latter shell is rather more slender than the other forms, one specimen being only thirteen mills. wide, though thirty-one long.

Reeve places *P. exilis* in the synonymy of *P. coarctata*, but considers *P. lima* distinct.

Paludina coarctata, LEA.—Shell smooth, ovate, compressed, thick, imperforate, olive color; spire drawn out; sutures much impressed; whirls flattened; aperture rather small, ovate, white.

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Fig. 108.

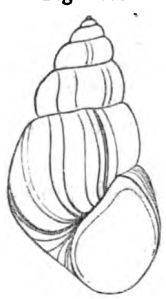
Paludina coarctata.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .50, length .98 inch.

This species, of which a single specimen only was received, differs from all of the genus which has come under my notice. It is remarkable for its compressed form, the body whirl being quite flattened. The apex is eroded, which prevents the number of whirls being ascertained: there appear to be five. The aperture is less round than usual in this genus, and may be rather more than half the length of the shell. (*Lea.*)

Paludina exilis, Anthony (*l. c.*).—Shell turreted, smooth, rather thick; color light apple-green; spire elevated, composed of about seven volutions; suture well marked; aperture small, broad-ovate, livid within; body whirl distinctly angulated, subumbilicate, and with very distinct lines of growth; columella well rounded and curved with a callous deposit, connecting perfectly with the outer lip, thus forming a continuous rim.

Fig. 109.



Paludina exilis.

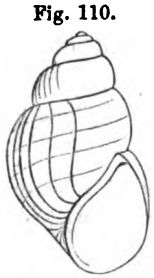
Length, 1¼ inch; breadth, ⅜ inch.

Hab.—Mississippi. My Cab.; Cab. H. Cuming, London; A. N. S. Philadelphia; State collection, Albany, N. Y.; Smithsonian collection.

Obs.—One of the most slender of our American species; *Paludina subsolida*, nob., is more ponderous, more globose, and has a larger aperture; no other species approaches it in general appearance; the whirls of this species taper more rapidly to an acute apex than in most of the species; compared with *P. integra*, Say, it is more slender, more solid, and the aperture is much smaller. (*Anthony.*)

Paludina lima, Anthony (*l. c.*).—Shell ovate, rather thin, dark green; spire obtusely elevated and composed of six convex whirls, which are strongly striate or subcarinate; sutures very distinct, and the upper part of each whirl being flattened renders it more conspicuous; aperture broad-ovate, about half the length of the shell, livid within; columella slightly rounded and callous deposit small; umbilicus none.

Fig. 110.



Paludina lima.

Length, 1¼ inch; breadth, ⅜ inch.

Hab.—South Carolina. My Cab.; Cab. H. Cuming, London; A. N. S., Philadelphia; Smithsonian collection, Washington, D. C.

Obs.—In general form not unlike our western *P. integra*, Say, from which it differs, however, by its revolving, raised striæ and by its carinæ, which are also well developed; the lines of growth are very strong, and decussating with the striæ give the surface a beau-

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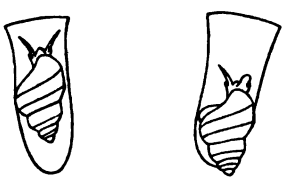
tifully rough appearance, which suggests its specific name. It is really one of our handsomest species, and so unlike all others that no American species can readily be mistaken for it. In most specimens the body whirl is very strongly carinate about the middle, and the outer lip is considerably produced as in *P. subsolida*, nob. (*Anthony.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8865	13	Natchez, Miss.	Lieut. Walles.	.....
8866	6	"	"	Cabinet series.
8867	2	Jackson, Miss.	Dr. Lewis.	*V. compressa*, Lewis.
9831	9	Big Prairie Creek, Ala.	Dr. Showalter.	.....

LIOPLAX, Troschel.

Foot very large, rather thin, elongated, greatly produced beyond the snout, truncated before, and becoming slightly narrower behind towards its rounded extremity. Colors as in *Melantho*. Head very small. Snout very short. Lingual teeth smooth at their apices or cusps. Tentacles broader and rather shorter than in *Melantho*. Right tentacle in the male very short, only one-third the length of the left, and broader than the snout. Lingual dentition as in *Melantho*. Right cervical lappet narrow, not plicated, but extending beneath the right tentacle and snout, nearly to the base of the left tentacle. Left cervical lappet very small. Branchiæ as in *Melantho*. (*Stimpson.*) Operculum with a subspiral nucleus.

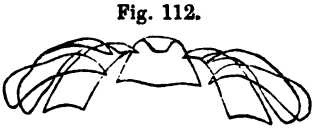
Fig. 111.



Female. Male.

Animal of *L. subcarinata*.

Fig. 112.



Lingual dentition of *L. subcarinata*.

Fig. 113.

Operculum of *Lioplax subcarinata*.

Shell thin, ovate-turreted, imperforate, spire produced, whirls rounded, carinated, covered with a thin epidermis; peristome thin, continuous.

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Lioplax cyclostomatiformis, LEA.—Shell subcylindrical, rather thick, pale horn color, smooth, imperforate; spire exserted, at the apex rose colored and obtuse; sutures very much impressed; whirls five, rounded; aperture small, nearly round, within salmon colored.

Fig. 114.

Lioplax cyclostomatiformis.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, L. W. Sloat, and Dr. Foreman. Diam. .32, length .82 of an inch.

This is a very remarkable species, assuming very much the form of an exserted *Cyclostoma*. A single, somewhat worn specimen only, was received. The aperture is rather more than one-third the length of the shell. Its subcylindrical form is very remarkable.

Since the above description was written, Dr. Jay and Dr. Foreman have placed in my hands specimens from the same locality. The epidermis is perfect, and they are of a greenish color. The interior of the aperture is bluish, while the apex is slightly salmon colored. (*Lea.*)

...na cyclostomatiformis, LEA, Tr. Am. Phil. Soc. IX, pt. i, p. 23 (1844); Obs. IV, 23; Proc. II, 83, (1841).—REEVE, Con. Icon. 43 (Feb. 1863).

...na contorta, SHUTTLEWORTH, of KÜSTER in Chemn. ed. 2, p. 20, pl. ..., f. 7–9 (1852).

...na elliotti, LEA, Proc. Acad. Nat. Sc. Phila. 1858, p. 166.

...specific name of this species must not be confounded with ... *Pal. cyclostomæformis* of D'Orbigny (Mag. de Zool. ... l. v, pl. ixxix, f. 1)

...outline of the back of the shell reminds one of the Cuban ... *...astoma*.. The three upper whirls are sometimes of a ... ht flesh color, contrasting with the dark green of the ... ter. The peristome is sometimes continuous, being ap... to the body whirl, and forming a rimate umbilicus. On ... ecimens I have detected minute revolving lines.

Pal. elliotti is a finer, better developed form of the species than that described as *cyclostomatiformis*, and has more acutely carinated upper whirls. A careful examination of Mr. Lea's types leads me to consider them identical. With his original description of the latter I have given Fig. 114 from his type, while below will be found the description of *Pal. elliotti* and a figure (115) of a specimen presented me under this name by Mr. Lea and now in the Smithsonian collection (No. 9015).

I have placed *Paludina contorta* in the synonymy of this species after a careful examination of a specimen received by Mr. Bland

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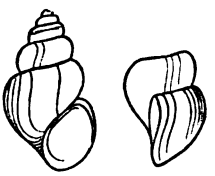
from Mr. Shuttleworth. The original description given below, and the copy of the figures (Fig. 116) confirm my opinion of its identity with Mr. Lea's shell.

Since the publication of this paper in the form of proof, Mr. Gill has criticized my opinion of the identity of *Pal. elliotti* with *P. cyclostomatiformis*. His opinion was not based on an examination of specimens, and has since been changed on seeing the Smithsonian series.

Paludina elliotii, LEA (*l. c.*).—Shell subcarinate, pyramidal, rather thick, greenish-olive, smooth, very narrowly umbilicated; spire elevated, subacute, flesh-colored at the apex; sutures excavated; whirls 7, rounded, obtusely carinated above, rather small; aperture subrotund, small, white within.

Othcalooga Creek, Ga. Bishop Elliott. (*Lea.*)

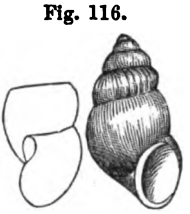
Fig. 115.



Paludina elliotti.

Paludina contorta, SHUTTLEWORTH (*l. c.*).—Shell non-rimate, cylindrically conic, subovate, shining, greenish with olive lines; apex eroded; whirls 6, strongly convex, divided by a deep suture, the middle ones carinated in the middle; aperture oblong, white; peristome straight, acute, curved above.

Fig. 116.



Paludina contorta.

Shell smooth, cylindrical-conic, turreted with a truncated apex; shining, green, with olive brown lines and striæ; sutures deep; whirls 6, ventricose, moderately increasing above, rapidly so towards the base, the middle ones clearly carinate in their centre, with brown angular curving striæ and lines at the middle keel; last whirl shorter than the penultimate, and near the upper portion of the aperture separated so as to form a deep groove of the suture. Aperture longitudinally rounded, inner lip appressed; peristome straight, acute, twisted above (fig. 9), curving again below its centre, beautifully rounded below and regularly blending with the columella. Height 8‴, breadth 5 ‴.

Alabama (Rugel), coll. Charpentier. (*Küster.*)

Reeve, *l. c.*, adopts the same view of *Pal. elliotti* and *contorta* as I have done.

No. 9147 of the collection is almost ecarinate, and nearer Mr. Lea's type of *cyclostomatiformis* than *elliotti*.

It is singular that the only two known species of *Lioplax* should share the peculiarity of having a strongly carinated form with perfect apex, as well as a form with rounded whirls and truncated apex.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8868	1	Coosa, River, Ala.	W. G. Binney.	.....
8869	1	Alabama.	A. N. S. Phila.	Cabinet series.
9015	1	Georgia.	I. Lea.	Figured in Fig. 115.
9149	1	Coosa River, Ala.	Dr. E. R. Showalter	.....

Fig. 117.

Paludina subcarinata.

Lioplax subcarinata, SAY.—Shell with three whirls, which are rounded, and subcarinated, reticulated with striæ and wrinkles, sometimes without the striæ; suture deeply impressed; apex truncated and re-entering; aperture more than half of the length of the shell, oval; elevated lines or subcarinæ on the body two, three, and sometimes none. Length half of an inch, breadth four-tenths.

Inhabits with the preceding species. (Delaware River.)

Animal viviparous, with a chestnut, coriaceous operculum, white, spotted with orange; head pale orange, not extending beyond the shell; tentacula darker, short, subulate; eyes situated at their base, elevated, black and conspicuous; base of the animal much advanced, broad, truncate, purplish before, tail rounded behind. (*Say.*)

Limnæa subcarinata, SAY, olim. Nich. Enc. ed. 1, 1817; ed. 2, 1818, pl. ii, f. 6.

Paludina subcarinata, SAY, Nich. Enc. ed. 3, 1819, pl. i, f. 7; ed. BINNEY, p. 47, pl. lxix, f. 7.—HALDEMAN, Mon., p. 8, pl. ii (1840).—DE KAY, N. Y. Moll., p. 87 (1843).—CHENU, Conch. Ill., pl. i, f. 6–8.—PHILIPPI, Conch. II, 7, pl. ii. f. 7 (1846).—KÜSTER, in Chemn. ed. 2, p. 29, pl. vi, fig. 10–14.—REEVE, Con. Icon. 44 (Feb. 1863).—Not of POTIEZ ET MICHAUD.

Paludina sulculosa, MENKE, Syn. Meth. p. 134 (1830).

Paludina bicarinata, POTIEZ et MICHAUD, Gal. des Moll., I. 249, pl. XXV, f. 17, 18.

Helix decisa, WOOD, Cat. Suppl. p. 21, pl. vii, f. 17 (1828); HANLEY'S ed. 226, f. 17 (1856).

Helix subcarinata, EATON, Zool. Text-Book, 195 (1826).

Lioplax subcarinata, TROSCHEL, Gebiss der Schn. 100 (1857).

There are in the mature perfect shell 3 more whirls than the number given by Mr. Say. It is a very variable shell. The whirls are sometimes truncated at the apex, very much rounded and hardly marked by the carinæ (Fig. 118), which in other localities are much developed, continuing to the sharp, well-defined apical whirls, on which is no trace of erosion (Fig. 119). Sometimes there is a prominent revolving

Fig. 118.

Lioplax subcarinata.

Fig. 119.

Lioplax subcarinata.

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Fig. 120.

Lioplax subcarinata.

elevated ridge below the carina on the body whirl. The revolving striæ are sometimes very strongly marked.

The operculum, which in the young shell is subspiral, in its later growth is concentric as in the other species of *Viviparidæ*.

Fig. 121.

Operculum of *Lioplax subcarinata.*

I have received specimens from Ohio, Indiana, Kentucky, Pennsylvania, and New Jersey.

Paludina sulculosa, Menke, *l. c.*, appears to me to be this species. I have seen no authentic specimen. His description is as follows:—

Paludina sulculosa.—Shell ovate-conoid, apex deroded; imperforate, thin, decussately striated, transversely lightly sulcated; green; whirls 4, angulated on the spire; suture deep; aperture ovate; lip simple. Length 4½, breadth 3 lines.

Ohio River at Cincinnati. Bescke. (*Menke.*)

Paludina bicarinata, Potiez and Michaud, is certainly this species, as shown by their description and the copy of the outline of their figure given below.

Paludina bicarinata, Pot. et Mich. (l. c.) not Say.—Shell oval, ventricose, brown or greenish, covered with numerous transverse ridges, two of which are more developed on the last whirl, the other whirls having but one medial carina; spire comprised of three or four convex whirls, of which the first are usually truncate; aperture ovoid; peristome simple. Length 12–15, breadth of last whirl 10–12 mill.

Fig. 122.

Paludina bicarinata.

Mr. Say and Ch. des Moulins have both given the same name to two different shells belonging to this genus, consequently it becomes necessary, in order to avoid confusion, to change that of Des Moulins, being posterior to Mr. Say's. Moreover, M. des Moulins' shell having three carinæ, will be better designated by the name *tricarinata*, adopted in this catalogue.

Delaware River, N. America. (*Potiez et Michaud.*)

I give also an outline of Wood's figure (Fig. 123) of *decisa*, of which no description is given, though it is specified as "tawny Delaware." It is evidently *Lioplax subcarinata.*

Fig. 123.

Paludina decisa, Wood.

In addition to the above fac-similes I have given one of Say's figures in Nicholson's Encyclopedia (Fig. 117.)

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Fig. 124.

Lingual dentition of *Lioplax subcarinata.*

The lingual dentition of *Lioplax subcarinata* is thus figured by Troschel (Fig. 124). There are seven teeth in each row, with recurved, simple, acute apices, the central broad at the base, narrower above, the laterals narrower. For the animal see p. 55.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8870	50+	Raritan River.	W. G. Binney.	.....
8871	5	.....	W. Stimpson.	Cabinet series.
8872	20	Burlington, N. J.	W. G. Binney.	.....
8873	9	Ohio.	W. Stimpson.	.....
8874	2	Licking River, Ky.	W. G. Binney.	.....
8875	8	Laporte, Ind.	"	Ecarinate.
9013	1	.....	.....	Figured in Fig. 119.
9056	30+	Laporte, Ind.	Dr. Lewis.	.....
9057	2+	Bank Lick, Ky.	"	.....

Doubtful, Spurious, and Extra-limital Species of Viviparidæ.

This completes the list of known North American *Viviparidæ.* There now follow notices of doubtful species and those which have been erroneously referred to the genus.

In the Trans. Lit. and Hist. Soc. Quebec, I, 196, occur the two following descriptions by Mrs. Shepard:—

Paludina ———.—Shell white; epidermis olive; spire the length of the aperture; last whirl inflated. Island of Orleans.

Paludina ———.—Shell pale buff; spire longer than the aperture; top obtuse. Found with the foregoing on the beach at the island; the whirls are not so much inflated as those of this genus generally are, but I think it would not range under any other; it has bluish bands of gray round the top of the whirls.

Paludina alleghanensis, Green.—Shell conical; spire elevated and rather obtuse; whirls four, rounded and nearly smooth, the ultimate whirl the largest; mouth oval, slightly angular near the upper part of the peristome, where it adheres to the body whirl; umbilicus none; epidermis dark brown color. Length two-tenths of an inch. Fine specimens of the shell are in the cabinet of Mr. W. Hyde. Mountains of Pennsylvania. (*Green.*)

Paludina alleghanensis, Green, in Doughty's Cabinet of Nat. Hist., II, p. 291 (1832).

The above is Green's description. I have not been able to obtain any information about the species. From the size and shape of the shell I should incline to believe it to be an *Amnicola.*

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Paludina solida, SAY, is mentioned by name only by Cristofori & Jan, Conch. Terr. et Fluv. p. 7 (1832).

Paludina canaliculata, GOULD, is mentioned by name only in the Preliminary Report on Mass. Shells, p. 107, and by WHEATLEY, Cat. 29.

Paludina unicolor, LAM., from South Carolina, mentioned by name only by WHEATLEY in his Cat. of U. S. Shells, p. 30. I have never known of any such species having been found there.

Vivipara bengalensis, LAM. (*Pal. elongata*, SWAINSON.—*Pal. multilineata*, SAY, N. H. D. II, 245, 1829, BINNEY'S ed., p. 146.—*Pal. vitula*, RAFINESQUE, (Bengal.) Atl. Journ., V. 169), said to have been found in St. John's River, Fla. Mr. Say's words are as follows: "Capt. Leconte presented me with a shell which, he informed me, he found in the River St. John, Florida. I described it nearly four years since under the name of *multilineata;* but, recently, being about to publish it, on a more attentive examination and comparison with a specimen of the *elongata* from Calcutta, given to me by Mr. Hyde of Philadelphia, I have concluded that it varies from that specimen only in having the umbilicus a little smaller."

See also *Ampullaria rotundata*, p. 6.

I have seen some specimens said to have come from Florida which might be referred to this species, but at present cannot consider its existence there sufficiently established to admit it in the list of American *Vivipara*. Haldeman (Mon., p. 24, pl. vii, f. 3, 4), thus describes and figures it, considering it probable that it was accidentally introduced into Florida together with *Ampullaria rotundata*, Say. They are both Calcutta shells:—

Fig. 125.

Paludina bengalensis.

"Shell lengthened, conic, and polished; composed of six or seven convex whirls, the surface of which is covered with minute transverse wrinkles, and numerous narrow spiral bands; apex pointed; suture deep; lines of accretion very fine; aperture regularly rounded, produced posteriorly. Color bright green, often passing into brownish; the spiral bands are fuscous, and the inside white." See also HALDEMAN, Mon. 24, pl. vii, f. 3, 4 (1841).

Paludina minuta, SAY, of KÜSTER, Chemn. ed. ii, p. 52, pl. x, f. 15–16, is *Cingula minuta*, TOTTEN. Mr. Say never described any such species. I have not given Küster's description as he quotes Totten's description, leaving no doubt of its identity.

Paludina hyalina, LEA, Tr. Am. Phil. Soc. VI, 17, pl. xxiii, f. 81 (1839), (not of MORELET), is a distorted *Planorbis exacutus*, q. v. (Land and Fr.-Wat. Sh. II.)

Paludina turrita, MENKE, Syn. Meth. p. 40, is mentioned by name only, *Cyclostoma marginatum*, SAY, being mentioned doubtfully as a synonym.

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Paludina aculeus, KÜSTER, Chemn. ed. ii, p. 73, pl. xiii, f. 8–9, is there said to be *Cingula aculeus*.

Paludina scalaris, JAY, Cat. 3d ed. 112, pl. i, f. 8, 9 (1839) = *Physa scalaris*, q. v. (Land and Fresh-Water Shells, II.) The name is also used in Zeit. für Mal. II, 164, 1845, by DUNKER.

Paludina porata, SAY, is mentioned by name only in MENKE's Syn. Meth. p. 42 (1830) with *P. katschkana*, PARR. and *P. fluminensis*, ZIEGLER, as its synonyms.

Paludina castanea, VALENCIENNES, Humboldt and Bonpland, Rec. d'Obs. II, 256, is not specified as American. The description was drawn from a specimen in the Paris Museum, locality unknown.

Paludina viridis of Virginia is quoted without description by SOWERBY (Tank. Coll. p. 43), *Helix viridata*, BUDGIN MS. being given as a synonym.

Paludina maxima, RAVENEL, Cat. 12 (1834), is unknown to me. No description was ever published.

Paludina decipiens is mentioned by name only among the American species added to those cited in Lamark's Animaux sans Vertebres, by GOULD's translation (p. 70, Genera of Shells). I have no information concerning it.

Finding *Pleurocera* of Rafinesque quoted in the synonymy of *Vivipara* by Adams, Gen. Rec. Moll., I was inclined to place the following species in *Vivipara*, but now omit them. See Rafinesque's Complete Writings, 1864, pp. 65 and 67.

Pleurocera acuta, Enum. and Acc., p. 3.
Pleurocera rugosa, " " " p. 3.
Pleurocera gonula, " " " p. 2.
Pleurocera verrucosa, Ann. of Nat., No. I, p. 11 (1820).

The genus *Pleurocera* is considered by Haldeman (Mon. of *Leptoxis* and Encycl. Icon., Baird's ed.) to be the same as *Io*, Lea, which last name not having priority of publication would be considered a synonym of *Pleurocera*. The following description of Rafinesque is translated from the Journal de Physique, &c. of Brussels, LXXXVIII, p. 423. The fac-simile Fig. 126 is from a MS. work of the same author, "Conchologia Ohioensis," presented by Prof. Haldeman to the Smithsonian Institution.

Pleurocera, *l. c.*—Shell spiral, oval or pyramidal, numerous rounded whirls; aperture oblong, oblique, base prolonged, twisted, narrowed above; outer lip thin, interior lip appressed to the columella, which is smooth and twisted, without umbilicus. Animal with a membranaceous operculum, proboscis-like head, inserted on the back; tentacles two, lateral, subulate, sharp, eyes at their exterior base. Family of *Turbinacea*. Species numerous, of which I have already twelve, all fluviatile, from rivers and creeks. (*Rafinesque.*)

Fig. 126.

Pleurocera.

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Omphemis plaioxis and *lacustris* of Rafinesque are mentioned by name only (Journ. de Phys. LXXXVIII, p. 424. The generic description is as follows:—

Shell oval; aperture rounded, lips detached, columella separated from the lower lip by a small oblong umbilicus; spire slightly oblique; animal with a membranaceous operculum, two flattened lateral tentacles, eyes at their exterior base. Family *Turbinacea*. Two species, *O. lacustris* and *plaioxis*, which is fluviatile. (*Rafinesque.*)

I take this opportunity of giving a fac-simile of a figure of the animal of *Leptoxis* as well as Rafinesque's description, translated from the work referred to, p. 424. The figure (127) is copied from the same MS. as that quoted on the last page, written in the well-known hand of Rafinesque.

Fig. 127.

Animal of *Leptoxis.*

Leptoxis, l. c., differs from *Lymnula* by its oval, ventricose shell of two or three whirls; aperture oval, almost as large as the whole shell; eyes exterior. Four species, fluviatile, &c. (*Rafinesque.*)

To the genus *Somatogyrus* (q. v.) must be referred the following:—

Paludina altilis, RAVENEL, undescr. Cat. S. C. 12 (1834).
Paludina pallida, LEA.
Paludina subglobosa, SAY.
Paludina fontinalis, PHIL.
Paludina isogona, DEKAY.

To the genus *Amnicola* (q. v.) must be referred the following:—

Paludina sayana, KÜSTER, Chemn. ed. 2, p. 48, pl. ix, f. 30–32.
Paludina emarginata, KÜSTER, *l. c.* p. 50, pl. x, f. 3, 4.
Paludina cincinnatiensis, KÜSTER.
Paludina porata, KÜSTER, *l. c.* and of PHILIPPI.
Paludina lustrica, KÜSTER, *l. c.*
Paludina granosa, SAY, of KIRTLAND'S Ohio Report, p. 174 (1838), and Sill. Am. Journ. [1] XXXI, 36 (1836); probably *Amnicola granum*, Say.
Paludina grana, SAY.
Paludina limosa, SAY.
Paludina obtusa, LEA (not of TROSCHEL).

To the genus *Pomatiopsis* (q. v.) must be referred the following:—

Paludina lapidaria, KÜSTER, *l. c.*
Paludina nickliniana, LEA.

To the genus *Fluminicola* (q. v.) must be referred—

Paludina nuttalliana, LEA.
Paludina nuclea, LEA.
Paludina virens, LEA.
Paludina seminalis, HINDS.

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To the genus *Leptoxis* are to be referred the following species:—

Paludina dissimilis, SAY (BINNEY'S ed. p. 48); DEKAY, N. Y. Moll. 86 (1843), and POTIEZ & MICHAUD, Gal. des Moll. I have not considered it necessary to repeat Mr. Say's description, the species being well known and universally acknowledged to be a *Leptoxis*.

Paludina crenata, SAY, is mentioned as a species of *Leptoxis* by Dr. Brot in his admirable "Matériaux pour servir à l'étude de la famille des Mélaniens," p. 24. Mr. Say described no such species. Prof. Haldeman describes a *Leptoxis* under this name in the Monograph referred to by Dr. Brot. See also *Somatogyrus*.

Fig. 128.

Paludina humerosa.

Paludina humerosa, ANTHONY, *l. c.*—Shell ovate, thick, bright green, imperforate; spire rather obtusely elevated, composed of about 5—6 convex whirls; upper whirls smooth, body whirl and preceding one strongly striate and granulate or subgranulate; sutures very distinct; aperture ovate, nearly one-half the length of the shell, livid within.

Length about half an inch.

Alabama. My cabinet.

A single specimen only is before me, but it is sufficiently distinct; its granulated surface and the broad shouldering of the whirls are its chief characteristics; compared with *P. genicula*, Con., it is more slender, darker in color, and its granulated surface is of itself a sufficient distinction. (*Anthony.*)

Paludina humerosa, ANTHONY, Proc. Acad. Nat. Sc. Phila. 1860, p. 71.

From an examination of Mr. Anthony's type I have no doubt of this being a nodulous species of *Leptoxis*, on which the nodules are slightly developed. Fig. 128 is drawn from it.

To the genus *Melania* are to be referred—

Paludina virginica, SAY, Nich. Enc. 3d ed. (1819).

Paludina rudis, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was given by Dr. Ravenel, who informs me that he found the species at Danville, on the Dan River, and subsequently sent some specimens to Mr. Lea, who described them as *Melania inflata*.

Paludina nitida, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was published. Dr. Ravenel informs me that on submitting specimens to Mr. Lea he pronounced them an undescribed species of *Melania*. They were found in the Dan River, at Danville.

To the genus *Rithynia* (q. v.) has been referred the following:—

Paludina tentaculata, LIN.

To the genus *Lithasia* is to be referred—

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Paludina incrassata, LEA. — Shell smooth, elliptical, rather thin, imperforate, dark horn color; sutures somewhat impressed; whirls somewhat convex; columella thickened above; aperture rather round, small, within bluish.

Fig. 129.

Paludina incrassata.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .52, length . . . inch.

Rather more than the first whirl only of the specimen before me is perfect, and I would not have proposed it for a new species, but that this part differs from any which has come under my notice. The callus on the superior part of the columella is very like that we find in the genus *Anculosa*. The aperture is smaller than usual in this genus. The upper whirls being decollate, neither their number nor the form of the spire can be given. (*Lea.*)

Paludina incrassata, LEA, Tr. Am. Phil. Soc. IX, 30 (1844); Obs. IV, 30; Proc. II, 243 (1842).

The figure given above (Fig. 129) is taken from Mr. Lea's original specimen. I have not seen others.

Paludina thermalis, LINN., is quoted by PHILIPPI from the United States, *Turbo minutus*, SAY, being given as synonym (Arch. f. Nat. 1844, 28).

FOSSIL SPECIES OF VIVIPARIDÆ.

Dr. Meek furnishes the following list of fossil American *Viviparæ*, most of which were first described as *Paludinæ*:—

Vivipara vetusta, MEEK & HAYDEN	Phila. Proc.	1860, 43;	1856, 121.
Vivipara leaii, "	"	1860, 184;	1856, 121.
Vivipara retusa, "	"	1860, 185;	1856, 122.
Vivipara conradi, "	"	1860, 185;	1856, 122.
Paludina peculiaris, "	"		1856, 122.
Vivipara trochiformis, "	"	1860, 185;	1856, 122.
Vivipara leidyi, "	"		1856, 123.
Vivipara raynoldsana, "	"		1861, 446.

Vivipara nebrascensis (*Paludina multilineata*, MEEK & HAYDEN, Phila. Proc. 1856, 120); 1860, 430.

Vivipara glabra, H. C. LEA, teste CONRAD, Proc. Phila. A. N. S. 1862, 567.

FAMILY RISSOIDÆ.

Lingual teeth 3, 1, 3; the rows being more transverse and less arcuated than in the *Littorinidæ*. Rhachidian tooth broader than long, and armed with basal denticles (so called

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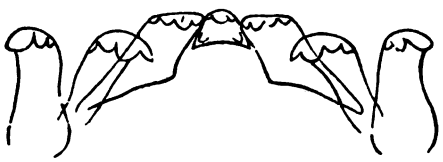
by Troschel) on each side, which may be either on the basal margin, or on the anterior surface of the tooth above the base; cusp recurved and denticulated. Intermediate tooth

Fig. 130.



Lingual dentition of *Amnicola sayana.*

more or less hatchet-shaped, having a handle-like process (peduncle) projecting outwardly from the base of the broad body which is denticulated at the upper margin. Lateral teeth generally slender and armed with numerous minute denticles at their superior margins. Shell small, spiral, turreted or depressed, often more or less umbilicated; aperture more or less rounded, never truly channelled in front; peritreme continuous. Tentacles elongated, with the eyes at their outer bases. Verge (male organ) exserted, situated on the back at a considerable distance behind the right tentacle. Gills both pallial; the right or principal one usually rather short and broad, and composed of few laminæ, which are much broader than high. Foot oblong, truncate before, rounded or pointed behind. Operculigerous lobe well developed. Operculum horny or partly shelly, spiral or concentric.

Station in fresh, brackish, or sea water, rarely on land. Distribution mundane.—[*Stimpson.*]

Dr. Stimpson subdivides the *Rissoidæ* into the following subfamilies:—

BYTHINIINÆ, with an ovate shell, a concentric operculum which is calcareous within, and with cervical lobes. They are comparatively large. Fresh water. Genus *Bythinia*, Gray.

RISSOININÆ, with an ovate or turreted shell, and a thick, corneous, subspiral operculum provided with an internal process (articulated). Size small. Marine. Genus *Rissoina*, D'Orb. (See Stimpson's paper, p. 39.)

RISSOINÆ, with an ovate or elongated shell, and a subspiral operculum not provided with a process. Foot without lateral

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sinuses. Rhachidian tooth of the lingual ribbon with the basal teeth on the inferior margin. Size small. Marine. Genera *Rissoa*, Frem., *Cingula*, Flem., *Alvania*, Risso, *Onoba*, H. & A. Ad., *Setia*, H. & A. Ad., *Ceratia*, H. & A. Ad.

Skeneinæ, with a depressed, almost discoidal shell, and a corneous, paucispiral operculum. Minute. Marine. Genus *Skenea*, Flem.

Hydrobiinæ, with shell and operculum and foot like those of the *Rissoinæ*, but with the rhachidian tooth of the lingual ribbon having the basal teeth on the anterior surface, behind the lateral margins. Size variable; some are minute, some as large as *Bythiniæ*. Living in fresh or brackish water. Genera *Hydrobia*, Hartm., *Littorinella*, Braun, *Amnicola*, Gould & Hald., *Bythinella*, Moq.-Tand., *Stenothyra*, Benson, *Tricula*, Benson, *Pyrgula*, Christ. & Jan, *Paludestrina*, D'Orb., *Tryonia*, Stm., *Potamopyrgus*, Stm., *Lithoglyphus*, Muhlfeldt, *Fluminicola*, Stm., *Gillia*, Stm., *Somatogyrus*, Gill, *Cochliopa*, Stm.

Pomatiopsinæ, with the shell and operculum as in the *Rissoinæ*. Foot with lateral sinuses. Size small. Amphibious. Genus *Pomatiopsis*, Tryon.

The land and fresh-water species only are included by me in the following pages. The figures are all somewhat enlarged.

BYTHINELLA, Moq.-Tand.

Lingual dentition of *B. thermalis*, according to Troschel: Rhachidian tooth moderately long, with the infero-lateral angles much produced. Intermediate tooth with the body longer than

Fig. 131.

Lingual dentition of *Bythinella nicklintana*.—[Stimpson.]

broad. Formula of the denticles: $\frac{9}{1+1}$ - 6 - 18 - 0. Tentacles tapering, but blunt at tip. Foot rather narrow, rounded behind.

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Verge (in *B. ferrusina*) bifid. Shell elongated-ovate, usually somewhat pupiform, imperforate, or simply rimate; apex obtuse. Aperture oval or rounded; peritreme continuous, slightly thickened. Operculum corneous, with the nucleus moderately large, not very close to the basal margin.

Station, fresh water.

Distribution, Europe and North America. (*Stimpson.*)

Bythinella attenuata, HALD.—Shell unusually long, slender, with 6 or 7 obliquely revolving, very convex whirls, separated by a deep suture; aperture small, ovate, with the peritreme level and continuous; labium in contact with the body whirl, leaving scarcely any perforation.

Fig. 132.

Bythinella attenuata.

Color pale-green beneath an extraneous coating of black. Taken from a spring in Montgomery County, Virginia, connected with Roanoke River.

I am not confident that this is not the adult of *nicliniana*, as there is a very close resemblance between that shell and the young of this species, when it has but four volutions. In the latter, the aperture appears to be rather contracted. (*Haldeman.*)

Amnicola attenuata, HALDEMAN, Mon. pt. 4, p. 3 of wrapper (1842); IB. Mon. p. 22, pl. i, f. 13 (1844?); IB. Journ. Acad. N. Sc. Phila. VIII, 200 (1842); IB. Proc. I, 78 (1841).

Amnicola elongata, HALDEMAN, *l. c.* in plate.

It is also said to inhabit New York. *Amnicola elongata*, Jay, of the Smithsonian Check Lists, is probably this species. No synonymy or reference is given by Dr. Jay (Cat., p. 278).

Bythinella nickliniana, LEA.—Shell turreted, green, smooth; apex obtuse; whirls 4, convex; aperture ovate. Hot Springs, Va. Diam. two-twentieths; length three-twentieths inch.

Fig. 133.

Paludina nickliniana.

This shell, with several other species, was brought by Mr. Nicklin from the Hot Springs of Virginia, and kindly placed in my cabinet. It lives in a rivulet, whose channel is supplied by the waters of a hot and a cold spring. The *Physa hurea* inhabits the same stream. It is the smallest species I know in our country, except the *granosa* of Say. It is rather larger, and very much resembles the *viridis* Lam. Its habitat, however, is very different, as the *viridis* lives in cold fountains. (*Lea.*)

Fig. 134.

Bythinella nickliniana.

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Paludina nicklíniana, LEA, Tr. Am. Phil. Soc. VI, 92, pl. xxiii, f. 109 (1839); Obs. II, 92.

Amnicola nicklíniana, HALDEMAN, Mon., p. 21, pl. i, f. 12 (1844?).

Mr. Lea's figure (Fig. 133) not being as correct a representation as desirable of the species, I add another (Fig. 134), copied from Haldeman.

The lingual dentition is figured on page 131.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8972	100+	Fishing Creek, Clinton	.....	Teste Lea.
8931	3	" [Co., Pa.	.....	Cabinet series.

Bythinella tenuipes, COUPER.—Animal "with the head proboscidiform, sub-bifid, sub-cylindrical; foot strap-shaped, anterior portion extending laterally, and emarginate before; tentacles setaceous; eyes at the external base of the tentacles; color, except the head and eyes, mottled white.

Shell "small, one and a half lines long, subumbilicated, oblong-ovate, turreted, thin, smooth, lines of growth very slightly marked; color light brown; volutions five, suture slightly impressed; aperture ovate, oblong, angulated above, rounded at base; labrum simple, sharp.

Fig. 135.

Bythinella tenuipes.

"Found in the rice-field ditches at Hopeton, Georgia; movement active, made by the joint action of the head and foot, the head advancing before the foot; floats on the surface of the water in an inverted position." (*Couper in Haldeman.*)

Amnicola tenuipes, COUPER, in HALDEMAN'S Mon. 23, pl. i, f. 14–15 (1844?); No. 7, p. 4 of wrapper (1844).

Bythinella binneyi, TRYON.—Shell minute, elongated, consisting of 4 to 5 very convex whirls; apex somewhat obtuse; aperture ovate or nearly suborbicular, both lips rounded; umbilicus very small. Color light horn. Length 3, diam. 1.6; length of aperture 1.25, breadth 1 mill.

Fig. 136.

Pomatiopsis binneyi.

Bolinas, California. Rev. J. Powell. My cabinet and cabinet of Mr. Powell. Some specimens of this very small and exceedingly fragile species were sent to me; they exhibit, however, all the stages of growth from the very young to adult form. None of them retained the operculum. It is much smaller than any other species of *Pomatiopsis*, and is not likely to be confounded with any of them. It approaches nearest in form to two European species of *Bythinia*, *B. acuta* and *B. viridis;* the former, however, has a more lengthened, acute spire, and the latter is a more robust and ventricose shell. (*Tryon.*)

Fig. 137.

Bythinella binneyi.

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Pomatiopsis binneyi, TRYON, Proc. Phila. Acad. 1863, 148, pl. i, f. 10.

Mr. Tryon's description is given above, as well as a fac-simile of his figure (Fig. 136). I have also given another figure of his original specimen.

Bythinella obtusa, LEA.—Shell subcylindrical, rather thin, dark-green, smooth, slightly perforate; spire short; at the beaks very obtuse; sutures impressed; whirls four, convex; aperture small, nearly round.

Fig. 138.

Bythinella obtusa.

Ohio. Diam. .07, length .10 inch.

This is among the smallest of the genus, and may at once be distinguished by its obtuse apex, which has the appearance almost of being truncate. The whirls do not decrease regularly from the lower one to the apex, the greatest diameter being apparently across the second whirl. In form, therefore, it has the aspect of a *Pupa*. It answers partly to the description of *Paludina alleghaniensis*, Green, but seems to differ in the truncate appearance of the apex, and in its size. Two specimens were found in a box, with some other small species, kindly sent me by Dr. Kirtland. It is rather less than *Pal. nickliniana*, but differs from it in being less tapering to the apex. It closely resembles *P. viridis*, Lam., but is rather larger, and more obtuse. There were no opercula to examine in these specimens; aperture rather more than one-third the length of the shell. (*Lea.*)

Paludina obtusa, LEA, Tr. Am. Phil. Soc. IX, 13 (1844); Obs. IV, 13; Proc. II, 34 (1841).

Amnicola obtusa, HALDEMAN, Mon. p. 24 (1844?).

Figure 138 is drawn from Mr. Lea's original specimen.

TRYONIA, STIMPSON.

Shell perforate, elongated, turreted, subulate, acute at summit and rather pointed at base; surface longitudinally ribbed or plicated, not spinous; whirls numerous, shouldered. Aperture small, oblique, rhombo-ovate; and somewhat pointed, sinuated, and effuse at base; outer lip thin and sharp, projecting below; inner lip appressed to the whirl above, peritreme however continuous. Operculum and lingual dentition unknown.

Station, fresh water.

Distribution, Southern California. (*Stimpson.*)

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Tryonia clathrata, STIMPSON.—Whirls eight. Longitudinal ribs variable in number, usually about twelve to each whirl. Surface otherwise smooth, or marked with delicate incremental striæ. There is no trace of revolving striæ or lines. Length 0.2 inch.

Fig. 139.

Tryonia clathrata.

The specimens described are in a semi-fossilized condition, mostly white, though not chalky, but with an ivory-like hardness. Some of them are translucent, looking as if silicified. From the circumstances under which they were found, however, it is probable that the species existed within a very recent period, if not indeed now living.

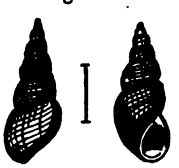
Large numbers of specimens were found, in company with other dead fresh-water shells of the genera *Physa*, *Planorbis*, *Amnicola*, *Cyclas*, etc., in the basin of the Colorado Desert, Southern California, by Mr. Wm. P. Blake, on one of the Pacific Railroad Surveys. The basin is the bed of an ancient lake, now dry. The specimens collected by him are in the museum of the Smithsonian Institution. (*Stimpson.*)

Tryonia clathrata, STIMPSON, Am. Journ. Conch. I, 54, pl. viii, f. 1, 1865.

The figure I have given is not a fac-simile of that of Stimpson.

Tryonia protea, GOULD.—Shell elongate, slender, variable; whirls seven to eight, rounded, divided by a deep suture, simple or variously ornamented, and barred with revolving ridges and longitudinal folds; aperture ovate; lip continuous, simple, scarcely touching the penultimate whirl. Length of the largest specimen three-tenths, breadth, one-tenth inch.

Fig. 140.



Amnicola protea.

From the Colorado Desert (Gran Jornada), Dr. T. H. Webb, W. P. Blake.

Peculiar from its large size and slender form, though differing greatly in its relative proportions. It differs from all others, in being variously sculptured with revolving ridges and longitudinal folds, like most *Melaniæ*. It varies greatly also in the relative proportions of length and breadth. It is as slender as *Amnicola attenuata*, Hald., and much larger. This appears to be the same shell as that subsequently described by Mr. Conrad, under the name of *Melania exigua*. (*Gould.*)

Amnicola protea, GOULD, Proc. Bost. S. N. H. V, 129 (March, 1855); P. R. R. Rep. V. 332, pl. xi. fig. 6—9 (1857); Prelim. Rep. App. 24 (1855); Otia, 217.

Melania exigua, CONRAD, Proc. A. N. S. Phila. VII, 269 (Feb. 1855).

Two of Dr. Gould's figures are copied in my figure (140). With them may be compared Fig. 141, which is drawn from a specimen presented by Prof. Haldeman (No. 9143), and pronounced by Mr. Conrad to be his *Melania exigua*, it having been one of

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the original specimens collected by Dr. Le Conte. Mr. Conrad's description, given below, bears an earlier date than that of Dr. Gould, but was not actually published at that time. I have, therefore, retained Dr. Gould's name. The two descriptions evidently refer to the same species.

Melania exigua.—Turreted; volutions 8, disposed to be angulated and somewhat scalariform above, cancellated, longitudinal lines wanting on the lower half of the body whirl; columella reflected; aperture elliptical. Length one-fifth of an inch. Colorado Desert, California. (*Dr. Le Conte.*)

Fig. 141.

Melania exigua, enlarged.

The specimens are numerous and of a chalky whiteness, showing that they are all dead shells. Said to have been found one hundred and twenty miles distant from any stream passed on the route. I am indebted to Dr. Caspar Parkinson and Mr. Mactier for specimens. (*Conrad.*)

Fig. 142.

Tryonia protea.

Fig. 142 is drawn from one of Dr. Gould's original specimens.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9143	4	Colorado Des.	Prof. Haldeman.	M. exigua, teste Conr.
9356	4	"	Mr. Mactier.	" "

COCHLIOPA, Stimpson.

Lingual dentition of the typical species: Rhachidian tooth short and broad; middle lobe of the basal margin very broad; basal teeth rather large. Intermediate tooth with a long peduncle, and square body having a cavity in the centre. Lateral teeth with an expansion of the inner side of the shank, separated from the summit by a deep rounded sinus; the outer lateral being more expanded than the inner. Formula of the denticles: $\frac{11}{2+2}$ - 8 - 18 - 24. Shell depressed-conic; base concave, carinated; umbilicus large and deep; aperture oblique. Operculum thin, corneous, sub-spiral. Rostrum of moderate size; tentacles rather long, tapering. Verge rather elongated, compressed, geniculated, and bifid, the inner branch being very small, less than one-fourth the size of the outer one and arising at the inner angle of the geniculation.

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Station, fresh water.

Distribution, California. (*Stimpson.*)

Cochliopa rowellii, Tryon.—Shell depressed, wider than high, consisting of 3½ whirls, which are regularly convex and rapidly enlarging; spire small, but little elevated, apex acute, sutures well marked; base convex, except that the region surrounding the umbilicus is flattened and inclining towards the axis, its outer boundary, consequently, is marked by an angle; umbilicus small, but very distinct; aperture half-ovate, the labrum well rounded and thin, the labium but slightly rounded, thickened, elevated from the body-whirl, forming an acute angle with the labrum above, and not impinging on the umbilicus. Surface marked with close, regular, minute striæ, which become enlarged in the flattened umbilical region into sharp crowded lines visible without a glass. Color light horn or yellowish, operculum darker. Operculum paucispiral, the lines of accretion very distinct and regular. Length 2.5, diam. maj. 4, min. 3; length of apert. 2, breadth 1½ mill.

Fig. 143.

Amnicola rowellii.

Clear Lake, California: Rev. J. Rowell. My cabinet and cab. of Mr. Rowell.

This species cannot be compared with any hitherto described, being much more depressed, and widely distinct in the form of the umbilical region. It may possibly form a species of the genus *Somatogyrus*, recently proposed by my friend Mr. Theo. Gill for a small mollusk from Iowa, which I described in the Proceedings of the Academy for Sept. 1862. (*Tryon.*)

Amnicola rowellii, Tryon, Proc. Phila. Acad. 1863, 147, pl. i, f. 8, 9.

Fig. 144.

Cochliopa rowellii, enlarged.

In addition to the fac-simile of one of the original figures of this species given above, Fig. 144 is drawn from No. 9312 of the collection, which was presented by Mr. Tryon.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9312	1	California.	G. W. Tryon.	Fig. 144.

GILLIA, Stimpson.

Lingual dentition of the type: Rhachidian tooth moderately long, deeply trilobate below; basal teeth close to the basal margin, and projecting beyond it. Intermediate tooth with the body subrhomboidal, slightly excavated in the middle. Outer

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lateral tooth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{9}{2+2}$ - 8 - 14 - 10. Shell rather large,

Fig. 145.

Lingual dentition of *Gillia altilis*.—[Stimpson.]

subglobular, thin, subperforate, smooth; spire small; suture not impressed. Aperture large, broad, ovate, oblique; outer lip thin, acute, not projecting anteriorly. Operculum thin, corneous, regularly ovate. Rostrum rather broad. Tentacles tapering, pointed. Verge small, simple, lunate. Ova-capsules hemispherical, each containing a single egg, and deposited singly or in groups or linear series.

Station, fresh water.

Distribution, the eastern parts of the United States of North America. (*Stimpson.*)

Gillia altilis, Lea.—Shell smooth, subglobose, thick, pale horn-color; spire short; sutures small; whirls four, obtusely angular above; aperture large, nearly round, white.

Fig. 146.

Melania altilis.

Santee Canal, South Carolina: Prof. Ravenel; Susquehanna River at Havre de Grace, Md.

(*Paludina altilis*, Prof. Ravenel's letter.) My cabinet and cabinet of P. H. Nicklin. Diam. .27, length .32 inch.

Last summer I found a number of this globose little species on the banks of the Susquehanna, and then considered it new, but on examination I found I had the same species, Prof. Ravenel having sent it to me years ago under the name of *Paludina altilis*. I am not aware that Prof. R. has ever described it, never having seen any account of it. His specific name for it is retained, but I have placed it among the *Melaniæ*, it having a distinct spiral operculum. It belongs to a natural group in the genus *Melania*, which have very low spires and a very large body whirl. There is a very slight impression on the superior part of the whirls below the suture. The aperture is about two-thirds the length of the shell. The epidermis in young specimens is a very pale yellow, almost white. (*Lea.*)

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Melania altilis, LEA, Proc. Am. Phil. Soc. II, 13 (1841); II, 150 (1842); Trans. VIII, 174, pl. v, f. 23; Obs. III, 12 (1843).—DEKAY, N. Y. Moll. 95 (1843).

Paludina altilis, RAVENEL, Cat. (no descr.).

Leptoxis altilis, HALDEMAN, Mon. Lept. 6, pl. v, f. 152 (1847?).

Mr. Lea also gives the river Schuylkill, at Philadelphia, as the habitat of this species (Pr. Am. Phil. Soc. II, 150). I have myself found it in great plenty in the Delaware, at Burlington, crawling on the mud exposed by the fall of the tide, together with *Amnicola limosa* and other species.

Mr. Lea's figure is copied in my Fig. 146.

Judging from the description and figure given by Haldeman of *Leptoxis crenata*, I should be inclined to refer it to this species, especially as its habitat is the same (Santee Canal). I have, however, followed the system of giving all the described species of this genus, without regard to synonymy—it being very difficult to decide doubtful cases. See the remarks under that species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9217	4	Delaware River, N. J.	W. G. Binney.	.....

Gillia crenata, HALDEMAN.—Shell obliquely transverse, subglobose, polished, rather solid, with four convex whirls, and impressed suture; aperture oblique, very large, angular posteriorly. Peritreme continuous on the same plane. Color yellowish-green, aperture white.

Fig. 147.

Leptoxis crenata.

Paludina crenata, SAY in cabinet.
Paludina altilis, RAV. in cab.

Fig. 148.

Leptoxis crenata.

Santee Canal, S. C.

Distinguished from *altilis* by its obliquity, greater thickness, straighter and thicker labium, comparatively shorter spire. In other respects the species are much alike. This seems to belong to the same genus as the European shells which Dr. Jay gave me as *Paludina naticoides* and *Lithoglyptus fuscus*. (*Haldeman.*)

Leptoxis crenata, HALDEMAN, Mon. 6, 67, pl. v, f. 153 (1847?).

The above is a copy of the original description and figure of this species. I am inclined to believe it to be identical with the

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Gillia altilis of the Santee Canal. The shell found in the Delaware, and considered by Mr. Lea as *Melania altilis*, and included by me in the preceding article as a form of *Gillia altilis*, may prove to be a distinct species. If so, its synonymy will be *Leptoxis altilis*, Haldeman, not *Melania altilis*, Lea.

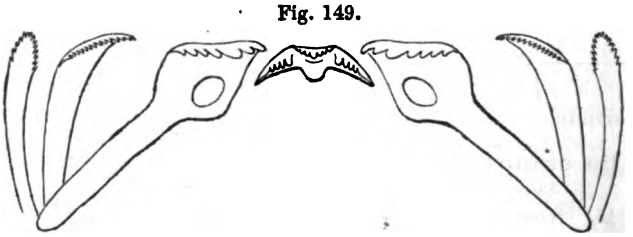
Doubtful Species of Gillia.

Leptoxis rapæformis, of Haldeman's Monograph, probably belongs to this genus. The species figured by him without name (pl. v, f. 157) certainly does.

SOMATOGYRUS, Gill.

Lingual dentition of type: Rhachidian tooth very short and broad. Intermediate tooth with the body perforated. Inner and outer lateral teeth with about the same number of denticles. Formula of the denticles: $\frac{7}{4+4}$ - 7 - 14 - 14. Shell rather large,

Fig. 149.



Lingual dentition of *Somatogyrus depressus*.—[Stimpson.]

globular, thin, smooth, perforate; spire small; suture impressed; body whirl globose, more or less shouldered above. Aperture large, oblique, rhombo-ovate, narrowly rounded in front and behind, with its peritreme thin and acute, and with its entire margin uniformly in one plane, the outer lip not projecting anteriorly. Operculum rather thick, corneous, subovate; inner margin concave near the upper extremity. Foot rather short. Rostrum broad. Tentacles tapering, pointed.

Station, fresh water.

Distribution, the central parts of North America. (*Stimpson.*)

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Somatogyrus depressus, TRYON.—Shell orbicular, sub-hyaline; whirls four, convex, the last large, equalling five-sixths the length of the entire shell; umbilicus narrow; aperture semi-circular, labrum appressed within; suture impressed. Length and breadth four mill. (Fig. mag. 2½ times.)

Fig. 150.

Amnicola depressa.

Hab. Mississippi River, at Davenport, Iowa: Prof. Sheldon. Coll. Acad. Nat. Sciences, and Smithsonian Institution, Prof. D. S. Sheldon, Geo. W. Tryon, Jr.

Shell subhyaline, rather solid, orbicular, with the spire depressed, consisting of four whirls; apex acute, suture profoundly impressed. Body whirl very convex, equalling five-sixths the length of the shell, narrowly umbilicate. Aperture semicircular, the inner lip being nearly straight. The only shell which this resembles is *Vivipara subglobosa*, Say, which differs in being double the size of *A. depressa*, with a rather more exserted spire, and in having a more concave inner lip. (*Tryon.*)

Amnicola depressa, TRYON, Proc. Ac. N. Sc. Phila. 1862, p. 452.
Somatogyrus depressus, GILL, Pr. Phil. Ac. 1863, 34 (no descr.).

Fig. 150 is drawn from Mr. Tryon's original figure.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9014	3	Davenport, Ia.	G. W. Tryon.	.....

Somatogyrus isogonus, SAY.—Subglobose, horn-color, volutions about four, rounded, obsoletely wrinkled; spire very short, about one-third the length of the aperture; suture profoundly impressed, so as to form a shoulder on the whirls; aperture much dilated, oval, being as obtusely rounded above as at base; umbilicus linear, distinct; operculum obviously spiral. Length under three-tenths of an inch.

Fig. 151.

Somatogyrus isogonus.

Fig. 152.

Leptoxis isogona.

Inhabits Bear Grass Creek, near Louisville.

Not very numerous. It is remarkable by the oval form of the much dilated aperture, and by the deeply indented suture. In old specimens the base is almost acutely angulated. (*Say.*)

Melania isogona, SAY, N. H. Diss. II, 227 (1829); Descr. 19; BINNEY'S ed. 144.
Amnicola isogona, LEA, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16. —WOODWARD, Man. pl. ix, f. 23.
Paludina isogona, DEKAY, N. Y. Moll. 85, pl. vii, f. 133.
Paludina pallida, LEA, Trans. Am. Phil. Soc. VI, 22, pl. xxiii, f. 104 (1839); Obs. III, 22.
?*Paludina fontinalis*, PHILIPPI, Conch. II, 5, p. 2, pl. ii, f. 9 (1846).—KÜSTER, Chemn. ed. 2, 56, pl. x, f. 27, 28.

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Leptoxis isogona, HALDEMAN, Mon. 6, pl. v, f. 155 (*Mudalia*) (1847?).
Paludina subglobosa, SAY, J. A. N. Sc. V, 125 (1825); BINNEY's ed. p. 115.—DEKAY, N. Y. Moll. p. 86 (1843).—HALDEMAN, Mon. pl. x, f. 7, 8.

Mr. Lea's description and figure of *Paludina pallida* are copied below.

Paludina pallida.—Shell ventricose, thin, light horn-color, smooth; sutures impressed; whirls four, convex; aperture nearly round.

Near Cincinnati, Ohio: T. G. Lea. My cabinet. Diam. .3 length .4 inch.

Fig. 153.

Paludina pallida.

This shell has recently been found by my brother, and I believe has not before been observed. It might at first be mistaken for a young shell, on account of its pale yellow color and translucency. In form, however, it differs from any species I have examined, the last whirl being very much enlarged, and the aperture being very large. (*Lea.*)

A translation of Philippi's description of *Paludina fontinalis*, and a fac-simile of his figure here follow. The shell described by him may be *S. integer*.

Fig. 154.

Paludina fontinalis.

Paludina fontinalis.—Shell minute, subglobose, subperforate, solid, greenish-yellow; whirls four, convex, the last ventricose, twice the length of the shell; aperture ovate, dilated. Height 2½‴ (lines), diameter 2½‴; height of the aperture 1⅔‴.

Melania integra, SAY (ubi?), according to specimens. Ohio, United States of America. (*Philippi.*)

An authentic specimen of *Paludina subglobosa*, preserved in the Philadelphia Academy, is without doubt identical with the shell received as Say's *Melania isogona*. A drawing of the specimen and copy of Say's description here follow.

The strict rules of nomenclature would require the substitution of *subglobosus* for *isogonus* as the specific name of this species. It does not, however, seem advisable in this case to abandon the name by which the species has so long been known.

Fig. 155.

Pal. subglobosa.

Paludina subglobosa, SAY.—Shell subglobose; whirls three and a half, much rounded, rapidly enlarging; suture profoundly impressed; aperture subovate; umbilicus very narrow, nearly closed by the labrum; spire very short, convex.

Inhabits the Northwestern Territory. Length less than three-tenths of an inch.

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I obtained this shell when traversing the northwestern part of the Union. It is much larger than the *porata*, nob., which it resembles considerably, but its whirls are much more rapidly enlarged, and the umbilicus is much narrower. (*Say.*)

Fig. 152 is from Haldeman's Monograph.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9216	2	Ohio.	W. G. Binney.	.....
9223	3	.....	.....	..... [Ward.
9224	4	Ohio.	Gen. Totten.	*Pal. subglobosa*, teste

Somatogyrus integer, SAY.—Subglobose, horn-color; volutions rather more than three, rounded, obsoletely wrinkled; spire very short, less than half the length of the aperture; suture rather deeply impressed; body whirl large, aperture dilated ovate, acute above; columella flattened, polished; labrum regularly rounded; base regularly rounded, without any undulations or sinus; umbilicus none; operculum obviously spiral. Length nearly one-fifth of an inch. Animal, foot longer than wide, rounded behind, with the anterior angles a little excurved; eyes black, conspicuous; tentacula rather long and slender.

Fig. 156.

Leptoxis integra, enlarged.

Inhabits the Ohio River and many of its tributaries.

This is a very common little shell, abounding more in many situations than any other species, particularly in the vicinity of the Falls of the Ohio. It may readily be taken for a young shell. (*Say.*)

Melania integra, SAY, New Harm. Diss. II, 276 (1840); Descr. 19; BINNEY's ed. p. 144.—DEKAY, N. Y. Moll. 96 (1843).

Anculotus pumilus, CONRAD, teste HALDEMAN and REEVE.

Anculotus integer, REEVE, Con. Icon. 35 (1861).

Leptoxis integra, HALDEMAN, Mon. Lept. 6, pl. v, f. 154 (1847?).

Amnicola integra, HALDEMAN, Jour. Phila. A. N. S. VIII, 200 (1842).

Paludina fontinalis, PHILIPPI? see last species.

Fig. 156 is copied from Haldeman's Monograph.

Fig. 157 is a fac-simile of the drawing of its lingual dentition, given by Troschel (Gebiss der Schnecken).

Fig. 157.

Lingual dentition of *Somatogyrus integer*.

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Anculotus pumilus, Conrad, which is considered a synonym in Haldeman's *Leptoxis*, is thus described in New Fresh-Water Shells, p. 62. An authentic specimen in the Academy's collection, at Philadelphia, does not appear to be *A. integra*.

Anculotus pumilus.—Shell very small, obliquely oval, blackish; spire consisting of one entire convex whirl; apex eroded; body whirl regularly convex; base with a groove behind the columella, aperture suborbicular, patulous.

Inhabits the Black Warrior River and Bayou Teche; the latter locality was communicated by Prof. Green, who supplied me with a specimen. (*Conrad.*)

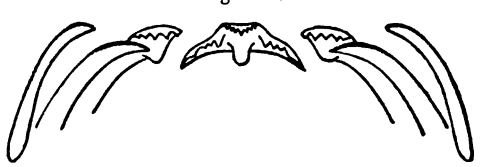
This species is nearly allied to, if not identical with *Somatogyrus isogonus*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9219	2	Ohio. [Pa.	.....	.....
9228	3	Flemington, Centre Co.,	.....	.....

AMNICOLA, Gould & Haldeman.

Jaws present. Lingual dentition of *A. porata:* Rhachidian tooth very short and broad, with a tongue-shaped process from the middle of the anterior surface, reaching beyond the base. Intermediate tooth with a short broad body having a strongly projecting infero-interior angle, and a very long peduncle. Formula of the denticles: $\frac{7}{4+4}$ - 5 - 18 - 30. Shell small, rather

Fig. 158.



Lingual dentition of *Amnicola porata.*—[Stimpson.]

short, ovate or subglobular, thin, smooth, perforate; spire not acute. Aperture broadly ovate, not oblique; outer lip thin and

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Fig. 159.

Operculum of *Amnicola.*

sharp, not projecting anteriorly. Operculum corneous. Foot rather short and broad, expanded and broadly rounded behind. Rostrum short. Tentacles cylindrical, blunt at their tips. Verge short, bifid, with a globular base.

Fig. 160.

Animal of *A. lustrica.*

Ova-capsules semi-lenticular in form, with a laminiform limb. Each contains but one egg.

Station, fresh water.

Distribution, North America. (*Stimpson.*)

Amnicola sayana, ANTHONY.—Shell lengthened, conic, composed of six very convex shining whirls; suture strongly impressed; lines of growth very fine; base with a narrow umbilic; aperture suborbicular; the labium slightly flattened, a small portion of it in contact with the body whirl.

Fig. 161.

Amnicola sayana.

Color bright yellowish-brown, translucent. Inhabits southwestern Ohio.

It is found on wet earth and roots of trees on the margin of a small stream near Cincinnati. (*Haldeman.*)

Cyclostoma cincinnatiensis, LEA, Oct. 1840, Proc. Am. Phil. S. I, 289; 1843, Tr. Am. Phil. Soc. VIII, 229, pl. vi. f. 62.

Amnicola sayana, HALDEMAN, Mon. p. 19, pl. i, f. 11 (1844?); pt. 4, p. 4 of wrapper (1842); J. A. N. S. Phila. VIII, 200 (1842).—ANTHONY, Cincin. Shells (1843), no desc.

Paludina sayana, KÜSTER in Chemn. ed. 2, p. 49, pl. ix, f. 30—32.

Chilocyclus cincinnatiensis, GILL, Proc. Phila. Ac. 1863, 34 (no descr.).

Cyclostoma sayana, JAY, Cat. [4], 198 (1852), no descr.; *Amnicola*, p. 278.

Troschel (Gebiss der Schnecken, p. 107, pl. viii, f. 1) figures the lingual membrane of this species, and his figure is copied in my figure 162; No. 8934 of the collection is from Mr. Anthony. No. 8971 is labelled by Mr. Lea "*Cyclostoma cincinnatiensis.*"

Found in Ohio and New York.

This species was first described by Mr. Lea (in Oct. 1840) as a *Cyclostoma*, under the specific name of *cincinnatiensis*. After the true characters of the genus *Amnicola* had been recognized by Gould and Haldeman, it became necessary to include in it this species. It would then have borne the name of *Amnicola cincinnatiensis*, had not the shell published in Jan. 1840, by Mr. Anthony, as *Paludina cincinnatiensis* also been found to belong

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to the genus *Amnicola* and become known as *Amnicola cincinnatiensis*. Mr. Anthony's name, having priority of publication,

Fig. 162.

Lingual dentition of *Amnicola sayana*.—[TROSCHEL.]

was retained. He suggested the substitution of *Amnicola sayana* for Mr. Lea's shell, but never described it. Prof. Haldeman followed his suggestion, giving Mr. Anthony as authority for the new name of *Amnicola sayana*. I have personally consulted the works containing the two descriptions and find the internal evidence supports Prof. Haldeman's view of the priority of Mr. Anthony's name. Dr. Stimpson refers this species to *Pomatiopsis*. If included in that genus it should bear the name of *Pomatiopsis cincinnatiensis*, Lea.

Mr. Lea's description and an enlarged view of the outline of his figure here follow:—

Cyclostoma cincinnatiensis. — Shell elevated in the form of a cone, smooth, shining, transparent, umbilicate; whirls 6, apex obtuse; margin of the lip reflected.

Fig. 163.

Cyclostoma cincinnatiense.

Vicinity of Cincinnati. Diam. .13, length .22 inch.

A small species which has been sent to me several times by my brother, who seems first to have observed it. It is about the size, and nearly the color, of *Paludina limosa*, Say. It is found on wet earth and roots of trees, on the margin of a small stream near Cincinnati. (*Lea.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8966	12	Elyria, O.	W. G. Binney.	.....
8967	10	.....	"	.....
8968	20	Greenwich, N. Y.	Dr. Ingalls.	.....
8969	20+	Little Lakes, N. Y.	Dr. Lewis.	*tenuipes*, teste Ingalls.
8970	6	Ohio.	J. G. Anthony.	*Cyclostoma cincinnatiense*, teste Lea.
8971	2	.....	.....	
8934	5	Ohio.	J. G. Anthony.	Cabinet series.
9293	5	Otter Tail Creek, Minn.	Kennicott.	.....

Amnicola porata, SAY.—Shell obtusely conic or subglobose; volutions four, convex, obsoletely wrinkled across; spire obtuse; labrum and

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labium equally rounded, meeting above in a subacute angle; the upper edge of the latter appressed to the preceding whirl; umbilicus very distinct.

Fig. 164.

Amnicola porata.

Inhabits Cayuga Lake. Cabinet of the Academy.

This species, which was found by Mr. Jessup, is rather larger and more globose than *P. limosa*, to which it is allied, and has a more distinct umbilicus. It resembles *P. decipiens* of Ferussac, but is much less acute, and rather smaller. (*Say.*)

Paludina porata, Say, Journ. Acad. N. Sc. Phila. II, 174 (1821); Binney's ed. p. 69.—Küster in Chemn. ed. 2 p. 63, pl. xii, f. 4, 5.—Philippi *Abbild.* 11, t. II, f. 10 (1846), not Adams (= *lustrica*).

Amnicola porata, Haldeman, Mon. p. 13, pl. i, f. 8 (1844), not of Gould, Inv., Linsley, Prescott, Mighels, Adams, &c. (= *limosa*).—De Kay, N. Y. Moll. p. 88, pl. xxxv, f. 333 (1843).—Chenu, Man. de Conch. II, 308; fig. 2194.

Big Sioux River and Moose Factory are the only other localities of which I have heard.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8976	20+	Big Sioux.	Dr. F. V. Hayden.	.....
8933	..	"	"	Cabinet series.
9025	2	Moose Factory, Br. Am.	C. Drexler.	.....

Amnicola pallida, Hald.—Shell thin in texture, conical, rather robust, composed of four and a half convex whirls, separated by a well marked suture; spire obtuse, rather longer than the aperture; umbilicus narrow; aperture ovate-orbicular, forming an angle posteriorly; a small portion of the labium confluent with the body whirl posteriorly.

Fig. 165.

Amnicola pallida.

Color pale ochraceous, translucent.

Inhabits Lake Champlain.—Prof. Adams.

Intermediate between *lustrica* and *porata*. It is not as short and transverse as the former, which, moreover, is widely umbilicate, and has the aperture regularly rounded posteriorly. According to the description of Professor Adams, the labium sometimes scarcely touches the body of the shell. The spire is comparatively longer than in *porata*, the outline less transverse, and the aperture not orbicular. (*Haldeman.*)

Amnicola pallida, Haldeman, Mon. pt. 4, p. 3 and 4 of wrapper (1842); Mon. p. 12, pl. i, f. 7 (1844?).

Amnicola lustrica, Adams, Thompson's Vermont, 169, 152 (1842), teste Haldeman.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8943	3	Little Lakes, N. Y.	Dr. J Lewis.	Cabinet series.
8974	20+	" "	"	.....

Amnicola limosa, SAY.—Shell conic, subumbilicate, dark horn colored, generally incrusted with a blackish irregular covering on the spire, and sometimes on the body, which completely obscures the obsoletely wrinkled epidermis; aperture ovate-orbicular; suture impressed.

Fig. 166.

Amnicola limosa.

Length three-twentieths, breadth one-tenth, of an inch. Cabinet of the Academy.

Animal whitish; head brown; mouth, tentacula, orbits, and vitta on each side of the neck, white; tentacula filiform, more than half as long as the base of the animal; rostrum about half as long as the tentacula, annulate with darker lines above; foot white, brownish above, short, suboval, truncated before, and rounded behind.

Extremely numerous on the muddy shores of the rivers Delaware and Schuylkill, between high and low water marks. (*Say.*)

Paludina limosa, SAY, Journ. Ac. Nat. Sc. Phila. I, 125 (1817).—IB. Nich. Encycl. 3d ed. (1819); BINNEY's ed. p. 61.—DE KAY, N. Y. Moll. 88.

Paludina porata, ADAMS in Thomp. Hist. of Vt. p. 152 (1842) (teste HALD.).—PHILIPPI, Z. für Mal. II, 77 (1845).

Amnicola porata, GOULD, Inv. of Mass. p. 229, f. 157 (1841).

Amnicola limosa, HALDEMAN, Mon. 10, pl. i, f. 5, 6 (1844?).—ANONYMOUS, Can. Nat. II, 214, fig. (1857).

No. 8960 of the collection is labelled *A. perobtusa* by Dr. James Lewis, but I know of no published description under that name.

From Hudson's Bay and Wisconsin to Virginia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8953	5	Madison, Wis.	I. A. Lapham.	*lustrica*, teste Lea.
8954	20+	Mohawk, N. Y.	Dr. Lewis.	.....
8955	20+	Burlington, N. J.	W. G. Binney.	.....
8956	12	Washington, D. C.	Dr. E. Foreman.	*porata*, teste Form.
8957	7	Nantucket.	W. Stimpson.	.....
8958	15+	Boston.	"	.....
8959	12+	Milwaukie, Wis.	I. A. Lapham.	.....
8960	20+	New York.	Dr. J. Lewis.	.....
8961	20+	Massachusetts.	W. Stimpson.	.....
8962	50?	Little Lakes, Mich.	Dr. J. Lewis.	.....
8963	9	Elyria, O.	W. G. Binney.	.....
8964	100?	Cambridge, Mass.	Dr. J. Lewis.	*A. porata*, Gould. Teste Lea.
8965	2	.....	.....	
8940	6	Burlington, N. J.	W. G. Binney.	.....
9020	5	Moose Factory.	C. Drexler.	.....

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Amnicola decisa, HALD.—Animal dark colored; head blackish, getting lighter posteriorly; tentacles translucent, dark on the edges; an orange-yellow spot at the posterior internal base of the tentacles; foot yellowish, thickly dotted with black above anteriorly; anterior edge nearly as dark as the head; base of the foot thickly dotted with orange on each side of the middle, the dotting being more sparse posteriorly, and entirely wanting anteriorly.

Shell rather short, conical; surface smooth, shining (when the dark foreign matter is removed) lines of growth fine; whirls five, not very convex, sutures impressed, base slightly perforate; aperture dilated, semicircular, labium slightly concave, in contact with the shell posteriorly, and nearly so throughout its length.

Fig. 167.

Amnicola decisa.

Color pale-green, and slightly translucent when the black foreign matter is removed. (See Fig, 160, on p. 81.)

Inhabits small streams connected with the Susquehanna, and has been observed in the Schuylkill by Dr. Griffith.

Allied to *Paludina similis*, Mich., of Europe. A greater portion of the labium lies closer to the shell in this species than in any other here described, except *A. nickliniana*, and *A. tenuipes*, which are slender species. At first view it might be taken for a minute *Paludina decisa*, and I have named it accordingly. In my correspondence I have hitherto called this species *limosa*. (*Haldeman.*)

Amnicola decisa, HALDEMAN, Mon. p. 7, pl. i, f. 2, 3 (1844?).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8929	1	District of Columbia.	Dr. E. Foreman.	Cabinet series.
8944	17	.....	.....	.....

Amnicola cincinnatiensis, ANTHONY.—Shell somewhat ventricose, subumbilicate, color delicately green, whirls four, smooth; spire entire at the apex and prominent; suture deeply impressed; aperture much dilated, approaching to orbicular, nearly half the length of the shell; length one-fifth of an inch.

Fig. 168.

Amnicola cincinnatiensis.

Found in the canal at Cincinnati, clinging to small stones. (*Anthony.*)

Paludina cincinnatiensis, ANTHONY, Boston J. N. H. III, pt. 1 and 2, p. 279, pl. iii, fig. 3, Jan. 1840.—KÜSTER in *Chemn.* ed. 2, p. 52, pl. x, f. 13, 14.

Amnicola cincinnatiensis, ANTHONY, List of Cinc. Shells, ed. 2 (1843), no descr.—HALDEMAN, Mon. p. 9, pl. i, f. 4 (1844?).—DE KAY, N. Y. Moll. 88 (1843).

Paludina emarginata, KÜSTER, Ch. ed. 2, p. 50, pl. x, f. 3, 4.

"This is the most robust species hitherto noticed among us,

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and is, in form, a miniature representation of *Paludina ponderosa*, except that it is decidedly umbilicated." (*Haldeman.*)

Fig. 169.

Paludina emarginata. (Mag. 5 times.)

Specimens labeled by Mr. Anthony are in the collection of the Smithsonian. Küster's description now follows. His figure is copied in Fig. 169. He quotes *Lymnæus emarginatus*, Say, as a synonym on authority of Brown.

Paludina emarginata, KÜSTER.—Shell small, narrowly rimate, ovate conic, apex eroded, sub-truncated, shining, thin, delicately striate, dark horn-colored; spire conic, whirls 4, convex; suture deep; aperture ovate; peristome straight, acute, its columellar portion reflected. (*Küster.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9026	3	Ohio.	J. G. Anthony.	.....

Amnicola granum, SAY.—Shell conic-ovate; whirls not perceptibly wrinkled, convex; suture deeply impressed; aperture orbicular, hardly angulated above; labium with the superior edge appressed to the surface of the penultimate volution; umbilicus rather small, profound.

Fig. 170.

Amnicola granum. (Mag. 3 times.)

Length less than one-tenth of an inch. Inhabits Pennsylvania. This very small species is found in plenty in the fish ponds at Harrowgate, crawling on the dead leaves which have fallen to the bottom of the water. It resembles *P. lustrica*, but is a smaller, less elongated shell, and the superior portion of the labium is not an unaltered continuation of the lips as in that shell, but is appressed to the surface of the penultimate whirl in the usual manner of calcareous deposition upon that part. (*Say.*)

Paludina grana, SAY, Journ. A. N. Sc. II, 378 (1822); BINNEY's ed. p. 110.
Amnicola granum, HALDEMAN, Mon. p. 17 (1844?).—DE KAY, N. Y. Moll. 88 (1843).

Ranges from Lake Superior to Virginia.

Fig. 150 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8930	2	District of Columbia.	I. Lea.	Cabinet series.

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Amnicola parva, LEA.—Shell obtusely conical, rather thin, yellowish, smooth, umbilicate; spire short; suture impressed; whirls four, inflated; aperture large, nearly round.

Springfield, Ohio. Diam. .15, length .18 inch. Fig. 171.

Amnicola parva.

The shell described by Mr. Anthony as *Paludina cincinnatiensis*, resembles this species, but is more elevated in the spire, and is a larger shell. It is more nearly allied to *Amnicola orbiculata*, herein described, but may be distinguished by its being a smaller shell, and being less round in the aperture. The base of the lip is disposed to be slightly angular; the aperture is about one half the length of the shell. (*Lea.*)

Amnicola parva, Lea, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841).—HALDEMAN, Mon. p. 24 (1844?).

Figure 151 is drawn from Mr. Lea's original specimen.

Amnicola orbiculata, LEA.—Shell orbicular, rather thin, yellowish, smooth, umbilicate; spire short; sutures much impressed; whirls five, inflated; aperture large, round.

Springfield, Ohio. Schuylkill? near Philadelphia. Diam. .18, length .18 inch. Fig. 172.

Amnicola orbiculata.

This species is very nearly allied to *Am. parva*, and may prove to be only a variety of it. The specimens before me are all larger, and they appear to be more globose. The aperture is about half the length of the shell. I found a single specimen of this species among many small shells which were thrown together in a box, as being collected from our vicinity. It may be possible it is an Ohio specimen gotten by mistake into the box. Found also in Cayuga Lake. (*Lea.*)

Amnicola orbiculata, LEA, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841).—HALDEMAN, Mon. p. 24 (1844?).

Figure 153 is drawn from Mr. Lea's original specimen.

Amnicola longinqua, GOULD.—Shell small, elongate-ovate, smooth; apex obtuse; whirls 5, rounded; suture deep; aperture elliptical, rounded posteriorly; columella very arcuate, subperforate. Length one-eighth, breadth one-tenth inch. Fig. 173.

Amnicola longinqua.

Found in the Colorado Desert (Cienaga Grande) by W. P. Blake.

In form it is much like *A. cincinnatiensis*, Hald., or like *A. galbana*, or like miniature specimens of *Paludina ponderosa*. It has a bleached or chalky color, probably from exposure, like the

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other species found on the Cienaga Grande, a region which is immersed a portion of the time, and dry the remainder, and was once, apparently, an extensive marsh, or shallow lake. (*Gould.*)

Amnicola longinqua, GOULD, Pr. Bost. S. N. H. V, 130 (Mar. 1855); P. R. R. Report, V, 333, pl. xi, fig. 10, 11 (1857); Prelim. Rep. App. 24 (1855); Otia, 217.

Fig. 173 is a fac-simile of the original figures referred to.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9220	5	Colorado Desert.	Blake.	Type.

DOUBTFUL AND SPURIOUS SPECIES OF AMNICOLA.

Amnicola integra, SAY of ANTHONY'S List of Cincinnati Shells is *Somatogyrus integer*.

Amnicola gracilis, GOULD, mentioned by name only, from Hot Springs, Va. Pr. A. N. S. Phil. II, 167. The New Zealand species of this name is the same as *Amnicola egena*, GLD., vide Otia, p. 245.

Amnicola elongata, JAY, Cat. [4] 278, Virginia; no descr.

Amnicola seminalis, COOPER, P. R. R. Rep. XII, pt. 2, p. 374. *Vide Fluminicola nuttalliana.*

Amnicola nuttalliana, COOPER, (*l. c.*), p. 374. *Vide Fluminicola nuttalliana.*

The following are mentioned by name only in WHEATLEY'S Cat. of U. S. Shells. No description of them was ever published.

Amnicola albilabris, WARD, Ohio.
Amnicola dentata, SAY, Florida.
Amnicola gibbosa, ANTH.
Amnicola sayana, LEA, Ohio.
Amnicola pallida, LEA. See *Somatogyrus isogonus.*

FOSSIL SPECIES OF AMNICOLA.

Amnicola galbana, HALD.—Shell conical, smooth, shining, composed of four and a half not very convex whirls, having the lines of growth very fine; base with a narrow umbilic; aperture nearly circular, slightly produced in an angle posteriorly; labium slightly thickened; a small portion of it, which is rectilinear, in slight contact with the body whirl.

Fig. 174.

Amnicola galbana.

Color . . . bleached and chalky.

Occurs fossil in the fresh water newest tertiary deposit in Sussex County, New Jersey. (*Haldeman.*)

Amnicola galbana, HALDEMAN, Mon. p. 15, pl. i, f. 9 (1844?); pt. 4, p. 4 of wrapper (1842).

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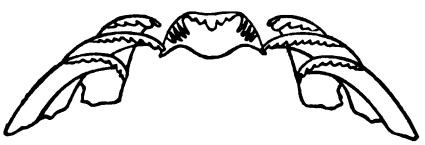
FLUMINICOLA, Stimpson.

Lingual dentition of the type: Rhachidian tooth more than twice as broad as long. Outer lateral teeth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{5}{3+3}$ - 6 - 10 - 7.

Fig. 175.



Lingual dentition of *Fluminicola nuttalliana*.

Shell comparatively large, obliquely ovate, thick, smooth, imperforate; spire moderate, obtuse. Aperture ovate; inner lip flattened, callous; outer lip effuse and projecting anteriorly, so that the peritreme is not continuously in the same plane. Operculum corneous. Tentacles tapering. Rostrum rather large. Foot broad. Verge large, compressed, with a broad semicircular laminiform expansion or wing on its left side. Ova-capsules large, circular, depressed, almost discoidal, each containing a large number of eggs.

Station, fresh water.

Distribution, Oregon and California. (*Stimpson.*)

Fluminicola nuttalliana, Lea. — Shell subglobose, horn-colored, smooth; sutures rather impressed; whirls 4; aperture white, nearly round.

Fig. 176.

Paludina nuttalliana.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .3, length .4 inch.

There is a very close resemblance between this species and *P. nuclea* (herein described). It is, however, less oblique, larger and less elevated in the spire. (*Lea.*)

Paludina nuttalliana, Lea, Tr. Am. Phil. Soc. VI, 101, pl. xxiii, f. 109 (1839); Obs. II, 101.

Amnicola nuttalliana, Cooper, P. R. R. Rep. p. 374 (no descr.) (1859).

Paludina seminalis, Hinds, Voy. of the Sulphur, p. 59, pl. xvi, f. 22

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(1844); Arch. f. Nat. 1843, II, 130; Annals Nat. Hist. X, 83, pl. vi, f. 8.

?*Leptoxis nuttalliana*, HALDEMAN, Mon. Lept. 6, pl. v, f. 156 (1847?).
Aeculotus nuttallii, REEVE, Con. Icon. 46 (1861) (excl. syn. *A. fuscus*).
Bithynia seminalis, CARPENTER, Brit. Ass. Ad. Sc. 1857, 326, no descr.
Amnicola seminalis, COOPER, P. R. R. Rep. XII, 374 (1859), no descr.
Amnicola hindsi, BAIRD, Pr. Zool. Soc. Lond. 1863, 67.

A very common species through Oregon and California. It was originally described and figured (as copied above) under the name of *Paludina*, and has since been referred to the genera *Amnicola*, *Bithynia*, and *Leptoxis*. Its outward features are most closely allied to those of the last mentioned genus. I should have considered it a *Leptoxis* had not Dr. Stimpson discovered its true characters. From the other genera to which it has been referred it is readily distinguished by its horny subspiral operculum and thick shell.

Fig. 177.

Fluminicola nuttalliana, enlarged.

I have seen no authentic specimen of *Paludina seminalis*, but have no doubt of No. 9212 and 9213 of the collection being referable to it. The original description and figure are copied below. It is from them I am induced to place it in the synonymy of *nuttalliana*, as done by Haldeman.

Fig. 178.

Pal. seminalis.

Paludina seminalis, HINDS.—Shell obtusely turreted, solid, horn colored, smooth; apex eroded; whirls 4; aperture bluish, expanded.

River Sacramento, California.

Distinguished from *P. nuclea*, Lea, which is from a neighboring locality, by its somewhat smaller size, bluish instead of white mouth, having one whirl less, the aperture more expanded, and absence of the black lines round the mouth, which when present is so good a character in his shell, but which, in any numerous specimens of it, I do not find at all constant, and usually only to be seen in those better developed. *Anodon angulatus* is also found abundant in this river, &c. (*Hinds.*)

I have not seen an authentic specimen of *Amnicola hindsi*. By the kindness of Mr. Carpenter I am able to give a translation of the original description and copy of the original figures. The latter will be published in the Report of the British N. A. Boundary Commission. The species seems to me identical with *Fluminicola nuttalliana*.

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Amnicola lindsi, BAIRD.—Shell obtuse, rather solid, greenish-olive, with delicate longitudinal wavy striæ and ill-defined transverse furrows; apex eroded; whirls four, the last one bluntly carinated near the middle, channelled at the impressed sutures; columella white; aperture bluish.

River Kootanie and stream at foot of Rocky Mountains, British Columbia.

Fig. 179.

Amnicola lindsi.

Differs from *Paludina seminalis*, Hinds, in contour, being bluntly carinate round the middle of the last whirl, and in being channelled round the suture. The surface of the shell is distinctly marked with numerous flexuose striæ, the lines of growth, and near the sutures is rather indistinctly marked with circular striæ. (*Baird.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9211	6	Columbia Riv. [ville, Or.	Dr. Cooper.	.....
9226	1	Rogue's R., Jackson-	.....	.....
9227	30+	Upper des Chutes R., Or.	Newberry.	.....
9230	13	" "	"	.....
9231	3	Willamette River, Or.	"	.....
9232	20+	Canoe Creek, Cal.	"	.....
9233	6	Pitt River, Cal.	"	.....
9234	11	R. br. of Klamath R., Or.	"	.....
9302	3	California.	"	Type, Fig. 177.
9212	5	Oregon and W. T.	"	*Pal. seminalis.*
9213	2	"	"	.....

Fluminicola virens, LEA.—Shell oblique, thick, somewhat granose, green; whirls rather inflated; aperture ovate.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .2, length .4 inch.

Fig. 180.

Paludina virens.

The apices of all the specimens which Prof. Nuttall gave me are destroyed, so that it is impossible to give some of the characters of this species. It is remarkably solid for so small a species. (*Lea.*)

Paludina virens, LEA, Tr. Am. Phil. Soc. VI, 91, pl. xxiii, f. 93 (1839); Obs. II, 93.

Leptoxis virens, HALDEMAN, Lept. 5, pl. v, f. 147–150 (1847?). See my Fig. 181.

Paludina nuclea, LEA (*l. c.*), VI, 91, pl. xxiii, f. 103 (1839); Obs. II, 91.

Fig. 181.

Leptoxis virens.

Haldeman, *l. c.*, places doubtfully in the synonymy *Pal. nuclea*, Lea, of which the original description and figure are given below.

Paludina nuclea, LEA.—Shell obtusely turreted, solid, horn-color, smooth; sutures impressed; whirls 5; aperture white, oval.

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Fig. 182.

Pal. nuclea.

Wahlamat, near its junction with the Columbia River. Prof. Nuttall. My cabinet. Cabinet of Prof. Nuttall. Diameter .2, length .4 inch.

This is a small, solid species, and is more oblique than *P. decisa*, Say. Like it, the apex is usually cut off. Round the mouth there is a black border, which contrasts with the pale horn-colored epidermis. (*Lea.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9225	2	Willamette River, Or.	.....	.....

Fluminicola fusca, HALDEMAN.—Shell subglobose, conic, smooth; spire loosened, with excoriated apex. Whirls subangular, forming posteriorly a slight projection on account of the labium turning abruptly at the suture, which is thus made conspicuous. Aperture rounded, posteriorly produced into a moderate angle. Columella thickened, somewhat concave, scarcely emarginate. Peritreme nearly uniform. Color reddish, labrum white.

Fig. 183.

Leptoxis. fusca.

Fig. 184.

Leptoxis fusca.

Inhabits Oregon Territory.

Somewhat resembles the preceding (*L. pisum*), but easily distinguished by the straighter labium and want of columellar emargination. In Fig. 84 the lines of growth are heavier, and a disposition is seen to form encircling striæ. (*Haldeman.*)

Fig. 185.

Leptoxis fusca.

Leptoxis fusca, HALDEMAN, Mon. Lept. 4, pl. iii, iv, f. 83, 84 (1847?).

To this species, of which the original description and figures are given above, I refer numerous specimens from Utah, Oregon, &c., in the collection.

Reeve quotes this species as *Anculotus fuscus* in the synonymy of *Anc. nuttalli.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9221	4	Head of Green R., Utah.	Malloney.	.....
9222	6	Shores of Lake Utah.	Capt. Burton.	.....

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POMATIOPSIS, Tryon.

Jaws like those of *Amnicola*, though smaller. Lingual membrane with numerous rows of 3, 1, 3 teeth; centrals small, broader at base, cusp recurved and tridentate, base with two obtuse denticles; laterals longer than broad, cusp recurved and denticulate, the inner lateral much broader than the two outer ones.

Fig. 186.

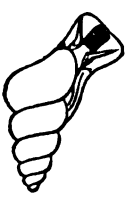
Lingual dentition of *Pomatiopsis lapidaria*.—[Stimpson.]

Tentacles short, subulate, pointed, rostrum large, longer than the tentacles. Foot broad. Verge very large, flattened, broad, convoluted in a spiral coil of one and a half turns. Ova capsules —? Shell small, thin, smooth, long, subumbilicate. Spire turreted. Aperture ovate, peritreme reflected. Operculum corneous.

Eastern North America.

Terrestrial.

Fig. 187.



Animal of *P. lapidaria*, enlarged.

Pomatiopsis lapidaria, Say.—Shell turreted, subumbilicate, with six volutions, which are obsoletely wrinkled across. Suture impressed. Aperture longitudinally ovate-orbicular, operculated, rather more than one-third of the length of the shell.

Fig. 188.

Pomatiopsis lapidaria.

Length about one-fifth of an inch. Collection of the Academy of Natural Sciences.

Inhabitant not so long as the shell, pale; head elongated into a rostrum as long as the tentacula, and emarginate at tip; tentacula two, filiform, acuminated at tip, short; eyes prominent, situated at the external or

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posterior base of the tentacula; base or foot of the animal dilated, oval, obtuse before and behind.

Found under stones, &c., in moist situations, on the margins of rivers. Like those of the genera *Lymnæa* and *Planorbis*, this animal possesses the faculty of crawling on the surface of the water, in a reversed position, the shell downward. (*Say.*)

Cyclostoma lapidaria, Say, Journ. A. N. S. Phila. I, 13 (1817); Binney's ed. 59.

Amnicola lapidaria, Haldeman, Mon. p. 18, pl. i, f. 10 (1844?); Jour. A. N. S. Phila. VIII, 200 (1842).

Paludina lapidaria, Say, Nich. Ency. 3d ed. (1819); Binney's ed., p. 56. —Küster in Chemn., ed. 2, p. 54, pl. x, f. 21, 22.—DeKay, N. Y. Moll. 86 (1843).

Melania lapidaria, Lewis, Bost. Proc. VIII, 255; Phila. Pr. 1862, 290 (no descr.).

Pomatiopsis lapidaria, Tryon, Proc. Phila. Acad. 1862, 452 (no descr.).

This is a widely distributed species, ranging at least from Georgia to New York, and from Missouri to Michigan. It is also found in the postpleiocene of the Mississippi River bluffs.

I have already given a figure of the animal and lingual dentition (Figs. 186 and 187).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8945	9	North Georgia.	A. Gerhardt.	.....
8946	9	Ohio?	J. G. Anthony.	.....
8947	8	Dist. of Columbia.	Dr. R. Foreman.	.....
8948	25+	.....	.....	.....
8949	20+	Ann Arbor, Mich.	W. G. Binney.	.....
8950	6	St. Louis.	"	Post-pleiocene?
8951	10+	New York.	Dr. J. Lewis.	.....
8952	20+	Elyria, O.	W. G. Binney.	.....
8935	3	New York.	Dr. J. Lewis.	Cabinet series.

Pomatiopsis lustrica, Say.—Shell conic; whirls slightly wrinkled, convex; suture profoundly indented; aperture oval, nearly orbicular; labrum with the superior edge not appressed to the preceding whirl, but simply touching it; umbilicus rather large, rounded.

Fig. 189.

Pomatiopsis lustrica.

Length, less than one-tenth of an inch. Cabinet of the Academy.

The smallest species I have seen. The aperture somewhat resembles that of a *Valvata*, to which genus it may probably be referable. Mr. Jessup obtained two specimens on the shore of Cayuga Lake. (*Say.*)

Paludina lustrica, Say, Journ. A. N. S. Phila. II, 175 (1821); Binney's

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ed. p. 69.—KÜSTER in Chemn. ed. 2, p. 63, pl. xii, f. 6, 7, not of ADAMS (= *pallida*).

Amnicola lustrica, HALDEMAN, Mon. p. 16 (1844).—DEKAY, N. Y. Moll. 87 (1843).

Found also in Wisconsin and British America.

Fig. 189 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8975	20+	Mohawk River, N. Y.	Dr. Lewis.	.....
8939	..	"	"	Cabinet series.
8977	2	Four Lakes, Wis.	I. A. Lapham.	.....
9019	3	Moose Factory.	C. Drexler.	.....

FAMILY CYCLOPHORIDÆ.

Lingual membrane narrow, with seven rows of recurved, hooked teeth. Head proboscidiform; tentacles subulate; eyes on the outer side of the base of the tentacles. Foot elongated. Operculum distinctly spiral, testaceous, cartilaginous or horny; whirls very numerous and sub-equal, or few and rapidly increasing. Shell usually covered with a horny epidermis; aperture, for the most part, circular.

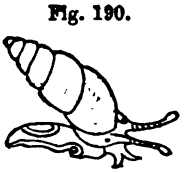
SUBFAMILY CYCLOSTOMINÆ.

Operculum ovate, rarely subcircular, composed of a few gradually increasing whirls; nucleus somewhat excentrical.

CHONDROPOMA, PFR.

Animal short, tentacles slender, enlarged at tips; eyes prominent, situated on a tubercle at the external base of the tentacles. Proboscis bifurcate. Operculum oval, subcartilaginous, flat, with few, rapidly increasing whirls, and a nucleus generally very excentric. Shell oblong-turreted, generally truncated at tip, more rarely globosely conic; aperture oval;

Fig. 190.



Animal of *C. dentatum*.

Fig. 191.

Operculum of *C. dentatum*.

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peristome simple, or more or less thickened, somewhat straight, rather expanded or broadly reflected.

Chondropoma dentatum, Say.—Shell conic cylindrical, or turreted, truncate at tip, the surface finely cancellate with raised, longitudinal, and revolving lines; color varying from yellowish to brown, usually with darker brown bands, which are generally interrupted in such a manner that the colors also form longitudinal stripes; whirls, when complete, seven; but the three uppermost are usually lost; they are rounded, and separated by a deep, crenulated suture; aperture rounded ovate, a little angular posteriorly; peristome a little reflexed, white; base with a minute perforation. Length 12, breadth 4 mill.

Fig. 192.

Chondropoma dentatum.

Cyclostoma dentatum, Say, Journ. Phila. Ac. V, 125: Binney's ed. 29.—DeKay, N. Y. Moll. 82.—Binney, Terr. Moll. II, 348, pl. lxii. *Chondropoma dentatum,* Pfeiffer, Mon. Pneum. Viv. I, 286; II, 140; Mal. Blatt. 1856, 132.—Gray & Pfeiffer, Brit. Mus. Cat. Phan. 203.—W. G. Binney, Terr. Moll. IV, 91, pl. lxxv, f. 24.

Key West: Fort Dallas, Florida.

Animal (see Fig. 190): Body very short, pale, tentacles darker, slender, somewhat enlarged at tips; eyes black, prominent, situated on a tubercle at the external base of the tentacles. Proboscis bifurcate, the two points serving the purpose of buccal tentacles. Operculum horny, the spiral of about two and a half turns.

Fig. 193.

Operculum of *C. dentatum.*

The shell is carried somewhat laterally, and very little elevated. The motions of the animal are very rapid; the locomotive disk contracts in an undulatory manner; and when the animal has advanced so that the shell drags along by its side, by a sudden contraction of the neck the tip of the shell is suddenly jerked forward, so as to bring the shell at right angles with it; and this movement, in a quarter of a circle, is very rapidly performed. As the operculum prevents the animal, when at rest and retired within its shell, from adhering by means of its foot, as is usual with the *Helicidæ*, the animal has the power of spinning

Fig. 194.

C. dentatum at rest, enlarged.

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a short thread, which is attached to the object of support; and by this it hangs suspended at pleasure.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8334	7	Florida.	W. G. Binney.	Cabinet series.

Spurious Species of Cyclophoridæ.

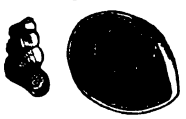
Cyclostoma cincinnatiensis, Lea, not Anthony & DeKay, is an *Amnicola*, and *C. lapidaria*, Say, Linsley, and Kirtland, is a species of *Pomatiopsis*, q. v.

Cyclostoma marginalis, Kirtland (Ohio Rep.), and *C. marginata*, Say, are species of *Pupa*, q. v.

Cyclostoma tricarinata, Say, is a *Valvata*.

Ctenopoma rugulosum, Pfeiffer, may, perhaps, prove an inhabitant of Florida. A single specimen found there is here figured.

Fig. 195.



Ctenopoma rugulosum.

Family TRUNCATELLIDÆ.

Lingual membrane with seven rows of recurved, hooked teeth. Animal with a broad, produced, bilobed muzzle, tentacles flattened, sub-triangular, eyes sessile on the middle of their upper bases. Foot very short and rounded. Operculum horny, subspiral. Shell lengthened, truncated, with a rounded aperture.

TRUNCATELLA, Risso.

Animal with a small foot, against the end of which rests the operculum when the animal is withdrawn; the tentacles are short, acute; the snout is extended beyond them as much as the whole length of the animal. The shell is carried horizontally. Operculum horny, hardly spiral, with a basal nucleus. Shell imperforate, but with an umbilical groove, cylindrical, turreted, usually pellucid and smooth, of a reddish horn-color; the upper whirls

Fig. 196.

Animal of *Truncatella.*

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are also truncated in the adult, the remaining ones are usually gradually increasing in size, and covered with more or less strongly developed ribs; the peristome is simple or double, sometimes reflected; the base is generally furnished with a prominent carina or ridge, formed by the peristome. Aperture rounded.

Dr. Gray describes *Truncatella* with distinct white jaws.

Fig. 197.

Lingual dentition of *Truncatella caribæensis*.—[TROSCHEL.]

The teeth of *T. caribæensis*, by Troschel: Central rather narrow, conical, apex recurved; first lateral very broad, apex recurved, denticulate; second lateral narrower, denticulated; outer lateral narrow, simple.

Truncatella caribæensis, SOWB.—Shell subrimate, subcylindrical, rather solid, in its truncated state but slightly decreasing in size towards the apex, reddish, or dark amber-colored, with delicate ribs, which are but little curved, and often hardly perceptible on the middle of the whirls; suture slight; whirls not truncated, three or four, distinctly increasing in size, equally convex, the last often smooth, slightly carinated on its base; aperture subvertical, ovally elliptic, angular above; peristome continuous, straight, thickened at its connection with the penultimate whirl. Length 7–8, diameter 3 millimetres; length of aperture 2½ millimetres.

Fig. 198.

Truncatella caribæensis, enlarged.

Truncatella caribæensis, SOWERBY MSS.—REEVE, Conch. Syst. 11, t. clxxxii, f. 7.—PFEIFFER in Zeitsch. f. Mal. 1846, 182; Mon. Auric. Viv. II, 185; Mon. Phan. Viv. II, 7; Brit. Mus. Cat. 134.—W. G. BINNEY, T. M. IV, 185, pl. lxxv, f. 2, 4.—CHEMNITZ, ed. 2; Auric. p. 9, pl. i, f. 35, 36; pl. ii, f. 22; not pl. ii, f. 2–4.

Truncatella gouldii, ADAMS, ined.

Truncatella succinea, ADAMS, Proc. Bost. Soc. 1845, 12.

Florida Keys, Mexico, Alabama; also Cuba and Jamaica.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8534	3	Florida.	W. G. Binney.	Cabinet series.

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Truncatella bilabiata, Pfr. — Shell subrimate, cylindrical, elegant, solid, opaque, brownish; ribs subarcuate, elevated, obtuse, at equal distances; suture deep and simple; remaining whirls 4½ to 5, convex, the last scarcely longer than the others, heavy and subcompressed at base; aperture vertical, oval, scarcely angular above; peristome double, the outer one white, heavy, and terminating in the basal ridge or carina, the inner one continuous. Length 5½, breadth 1¾; length of aperture 1½ millimetres.

Fig. 199.

Truncatella bilabiata, enlarged.

Truncatella bilabiata, Pfeiffer in Wiegm. Arch. 1840, I, 253; in Zeit. f. Mal. 1846, 187; Mon. Auric. Viv. 192; Mon. Pneum. Viv. II, 8; Brit. Mus. Cat. 140.—W. G. Binney, T. M. IV, 188, pl. lxxv, f. 3, 7.—Chemnitz, ed. 2, p. 7, pl. i, f. 27–31.

Florida, Cuba, Carmen Island.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8532	3	Florida.	W. G. Binney.	Cabinet series.

Truncatella pulchella, Pfr.—Shell subrimate, oblongly subcylindrical, light, reddish horn-color or amber, shining, pellucid, lightly ribbed; ribs scarcely elevated, thread-like, at irregular intervals, often more distinct at the moderate suture; remaining whirls 4 to 4½, rather convex, gradually increasing in size, the last generally smooth below the middle, compressly carinated at its base; aperture subvertical, obliquely elliptical, enlarging at base; peristome simple, continuous, somewhat expanding, and furnished with a slight ridge at its right extremity. Length 4½–5, of aperture 1⅔ mill.

Fig. 200.

Truncatella pulchella, enlarged.

Truncatella pulchella, Pfeiffer in Wiegm. Arch. 1839, I, 356; in Zeitsch. f. Mal. 1846, 186; in Mon. Auric. Viv. 192; Mon. Pneum. Viv II, 8; Brit. Mus. 140.—W. G. Binney, T. M. IV, 189, pl. lxxv, f. 1, 9, 10.—Chemnitz, ed. 2, Auric. 10, pl. ii, f. 11–15.

Florida. Also a West Indian species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8533	2	Florida.	W. G. Binney.	Cabinet series.

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Truncatella subcylindrica, GRAY.—Shell scarcely rimate, cylindrical, furnished with regular, crowded ribs, less prominent or obsolete at the suture, shining, pellucid, yellowish horn-color or hyaline; remaining whirls four, rather convex, flattened in the middle, regularly increasing, the last not ridged on the base; aperture vertical, ample, angularly oval, sub-effuse at base; peristome lightly thickened, its external margin sub-produced, the columellar portion briefly reflected, appressed and above thickened. Length 5, breadth 2 mill.

Fig. 201.

Truncatella subcylindrica, enlarged.

Helix subcylindrica, PULTENEY, Cat. Dorsetsh. 49.—MONTAGU, Test. Br. II, 393.

Truncatella subcylindrica, GRAY in Turton's Man. 22, f. 6.—SHUTTLEWORTH, Diagn. 7, 154.—PFEIFFER, Mon. Auric. Viv. 187; Mon. Phan. Viv. II, 7; Br. Mus. Cat. 136.—W. G. BINNEY, T. M. IV, 186, pl. lxxv, f. 5, 6, 8.—ORBIGNY, Moll. Cub. II, 5 (excl. *T. truncatula*).

Truncatella truncatula, LOWE in Zool. Proc. 1845, 217?; in Zool. Journ. V, p. 299, tab. xiii, f. 13–18?

Truncatella caribæensis, PFEIFFER in Zeitsch. f. Mal. 1846, 182, ex parte.—KÜSTER in CHEMN. ed. 2, Auric. pl. ii, f. 1–4.

A West Indian species found on the Florida Keys.

Truncatella californica, PFR.—Shell not rimate, cylindrical, truncated at tip, thin and translucent with light striæ, shining, amber-colored; spire in the perfect state of the shell composed of about ten whirls, of which four only are not deciduous; these are convex, increasing in size rather rapidly; aperture oval, vertical, rounded above; peristome simple and continuous, slightly expanded, its pillar margin scarcely attached to the shell. Length 4⅜, diam. 1⅜ mill.

Fig. 202.

Truncatella californica, enlarged.

Truncatella californica, PFEIFFER, Proc. Zool. Soc. London, May, 1857, 111; Mon. Pneum. Viv. II, 7.—W. G. BINNEY, T. M. U. S. IV, 28, pl. lxxix, f. 20, 22.

Truncatella gracilenta, GOULD, Proc. Phila. Ac. Nat. Sc. X, 1858, errata.

San Diego, California.

FAMILY NERITIDÆ.

Jaws two, above and below, with denticulated margins. Lingual dentition very similar to that of the *Trochidæ;* the central teeth few, the lateral hooks, or uncinæ, very numer-

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ous. Head with a broad, short muzzle; tentacles slender and subulate, with the eyes on stout peduncles at their outer

Fig. 203.

Lingual dentition of *Neritella reclivata.*

bases; no head-lobes or neck-lappets. Foot oblong, triangular, the sides simple, without filaments, or lateral membrane. Operculum articulated, shelly, subspiral. Shell depressed or oval, not umbilicated; spire very short, cavity simple from the absorption of the internal portions of the whirls; aperture semiovate, not pearly within.

In this tribe of Scutibranchiate mollusks the sides of the foot are without membranaceous fringes and tentacular filaments; the animal is not voluminous, and the foot is small and never envelops the shell; in their dental system they resemble the *Trochidæ*, as also in their muzzle-shaped heads and pedunculated eyes. They are littoral animals, inhabiting the stones and rocks along the shore, feeding on the algæ that abound in that situation. They appear to be more active during the night, resembling in this respect, the *Patellidæ*, which are said to enjoy considerable locomotive powers at that time.

There are several genera included in this family which are not fluviatile, and therefore not noticed by me. Such are *Nerita*, *Clithon*, and *Catillus*. The genus *Neritella* alone is referred to.

NERITELLA, Humphrey.

Operculum testaceous, the outer surface smooth, with two apophyses, the upper shorter, sometimes dilated and crested, the lateral in the form of an arched rib. Shell globose, oval, turriculated or conical, thin, often depressed, covered with a horny epidermis; aperture semilunar; inner

Fig. 204.

Operculum of *Neritella reclivata.*

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lip straight, flattened, the margin smooth or denticulated; outer lip simple internally.

The *Neritellæ* are tolerably numerous in species; they are inhabitants of fresh water, and are usually covered with an epidermis; some among them are found crawling on the stones in shallow water; others live in deeper water, half buried in the mud, some in brackish and others even in salt water; some are amphibious, clinging to the roots of Nipah palms and other trees on the margins of rivers, while a few inhabit the foliage of tall trees that overhang ponds and rivulets. The genus *Neritella*, as restricted, is characterized by the shell being transverse, elliptical or hemispherical; the spire lateral or none; the inner lip septiform, flattened and striolate, with the margin finely denticulate; with one or two exceptions they are not found in the frigid or temperate zones, but are extensively distributed in every other part of the world.

I adopt the name *Neritella*, instead of *Neritina*, on account of its having precedence. I presume a description was published by Humphreys, but do not have access to a copy of the Museum Colonnianum. *Neritella* is generally preferred in the more recent works on Conchology.

The genus *Neritella*, as restricted by Messrs. Adams, contains no North American species. The following are the subgenera proposed by them, with the American species quoted in each:—

Subgenus **Neritina**, Sw. (*Clithon*, Recluz).—Shell globular, oval or turriculated, smooth or spirally striated, often adorned with vivid and varied colors; inner lip septiform, crenulated, rarely simple.

N. cassiculum. | *N. sayana.*
N. reclivata. |

Subgenus **Vitta**, Klein (*Theodoxus*, Montf.; *Elea*, Ziegl.).—Shell transverse, smooth or nearly smooth; spire lateral, inclined over the aperture, more or less prominent; inner lip usually flat, with the margin simple or denticulated; operculum uniform, without colored zones.

N. jayana. | *N. picta.*

Subgenus **Dostia**, Gray (*Sandaliformes*, *Mitrula*, Mke.).—Shell slipper-shaped, solid; apex entirely posterior, rolled in a half turn on the

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side; peritreme continuous and free; inner lip septiform, the margin united to the inner portion of the peritreme, slightly arched in the centre, and denticulated.

(No American species.)

Subgenus **Alima**, Recluz.—Shell depressed, suborbicular, with the upper extremity of the outer margin prolonged into a lateral wing; spire subposterior and lateral; inner lip septiform, margin finely denticulate.

(No American species.)

Subgenus **Neripteron**, Lesson.—Shell catilliform, with the two extremities of the outer margin prolonged into lateral auricles; spire subposterior and lateral; inner lip septiform; margin finely denticulate.

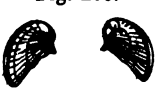
(No American species.)

Neritella reclivata, Say.—Shell thick, strong, globose-oval, greenish-olive, with numerous approximate, parallel, irregularly undulated green lines across the volutions; volutions about three, the exterior one occupying nearly the whole shell; spire very short, obtuse at the apex, and frequently eroded to a level with the superior edge of the body whirl; mouth within bluish-white; labrum acutely edged; labium callous, minutely crenated on the edge, and with a small tooth near the middle. Greatest diameter nineteen-twentieths of an inch; greatest transverse diameter four-fifths of an inch.

Fig. 205.

Neritella reclivata.

Fig. 206.



Operculum of *Neritella reclivata.*

Inhabits East Florida. Cabinet of the Academy and Philadelphia Museum.

Animal pale or less distinctly lineated, or clouded with black; foot rounded, almost orbicular, hardly as long as the shell is broad; above with four more or less distinct, black, parallel lines; rostrum dilated, truncated, tip with four black lines, a black band connecting the eyes; eyes prominent, appearing to be placed on a tubercle at the outer base of the tentacula, black, with a white orbit; tentacula with darker or black lines, setaceous, and longer than the breadth of the rostrum; beneath immaculate.

I found this species in great plenty, inhabiting St. John's River in East Florida, from its mouth to Fort Picolata, a distance of a hundred miles, where the water was potable. It seemed to exist equally well where the water was salt as that of the ocean, and where the intermixture of that condiment could not be detected by the taste. Its movements are remarkably slow. (*Say.*)

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Theodoxus reclivatus, Say, Journ. A. N. Sc. Phila. II, 257; Binney's ed. 87.
Neritina reclivata, Reeve, Con. Icon. 34 *a*, *b*, Oct. 1855.
Neritina floridana, Shuttleworth in Reeve, Con. Icon. 85 *a*? Nov. 1855.

Fig. 207 represents the lingual dentition of this species, from a

Fig. 207.

Lingual dentition of *Neritella reclivata*.

specimen presented the Smithsonian Institution by Prof. Agassiz. The lingual plate is composed of 48 rows; median tooth small, slightly tridentate; first lateral large, trapeziform; second and third lateral minute, simple; uncini 18 or 19, first large, marked with one large denticle, flanked by ten minute denticles; the rest close set, long, slender, recurved, and blunt at ends.

Reeve quotes it from Mexico.

I have seen no authentic specimen of *Neritina floridana*, Shuttl., placing it in the synonymy after a study of Reeve's description and figure, which are copied below.

Neritina floridana.—Shell compressly-globose, rather solid, spire obtuse, whirls rather flattened at the upper part, columellar area callous; greenish-white, densely elegantly painted with very fine olive lines.

Fig. 208.

Neritina floridana.

Neritina floridana, Shuttleworth MS. in Museum Cuming.

Florida. Closely allied to *Neritina reclivata*, from which it scarcely differs, except in being of a more stunted growth. (*Reeve.*)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9299	1	Florida.	L. Agassiz.	Fig. 207.
9307	..	"	"	Fig. 208.

Neritella californica, Reeve.—Shell ovate, rather thin, concave beneath, spire rather narrowly produced, obtusely flattened at the apex, whirls smooth, aperture expanded, columellar area concavely flattened,

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rather broad; black, blue within, columellar area deep blood-stained.

Fig. 209.

Neritina californica.

Gulf of California. This appears to be distinct from any of its congeners in form, while the deep-toned coloring is characteristic. (*Reeve.*)

Neritina californica, REEVE, Con. Icon. 20, *a*, *b* (Oct. 1855).

I have seen no authentic specimen of this species, the original description and figure of which are given above.

Neritella cassiculum, SOWERBY.—Of a globose form, slightly inclining to oval, with an olive-green epidermis, under which may be seen numerous black lines, angulated so as to leave white, triangular spots, which are larger in three bands across the shell; spire obtuse, consisting of four whirls; aperture semicircular, with the outer lip slightly thickened and the columella inclining to orange, narrow, swelled, and minutely crenulated on its nearly straight edge. Locality unknown. (*Sowerby.*)

Fig. 210.

Neritina cassiculum.

Neritina cassiculum, SOWERBY, Conch. Ill. f. 55; Thes. Conch. 521, pl. cvi, f. 194.—CARPENTER, Maz. Shells (1858), 258; Brit. Mus. Rep. pl. ix, f. 5 (1857).

Carpenter quotes this species from Mazatlan. I have seen no specimen, but give above the original description and figure.

Neritella picta, SOWERBY.—Subglobose, grayish, variously painted, with black lines or reticulations and whitish spots. There is a peculiar enamel-like appearance about the external surface; the columella is invariably of a chestnut color, rather swelled, and obscurely crenulated at the margin.

Fig. 211.

Neritina picta.

Panama, on a mud bank, partially overflowed with fresh water: Cuming. (*Sowerby.*)

Neritina picta, SOWERBY, Pr. Zool. Soc. 1832, 201; Illustr. pl. lxxxvi, f. 1; Thes. Conch. 530, pl. cxvi, f. 267–9.—REEVE, Con. Icon. 101.—DESHAYES in LAMARCK, VIII, 588.—CARPENTER, Maz. Cat. 259 (1856).

A very variable species found within the limits included in my work—at Mazatlan, as well as further south. The original description and figure are given above.

There is a *Neritina picta*, of Ferussac (Hist. fig. 4–7), found

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fossil in France. Some of the references quoted above are referred to Ferussac's species by Grateloup (Soc. Lin. Bord. XI, 127). I have not the means of settling the synonymy.

Neritella showalteri, LEA.—Shell smooth, rounded, semitransparent, yellowish horn-color; spire very much depressed; sutures slightly impressed; whirls three, inflated; aperture semi-rotund; inner lip dilated, white, thickened, without teeth and incurved; outer lip acute, dilated and thin. Operculum — ?

Fig. 212.

Neritina showalteri.

Coosa River, ten miles above Fort William, Shelby County, Alabama: E. R. Showalter, M. D. My cabinet, and cabinets of Dr. Showalter and Dr. Lewis, and Academy of Natural Sciences. Diam. .22, length .18 inch.

The discovery of this shell by Dr. Showalter marks the first notice, I believe, of the genus *Neritina* being found in our waters. His very close observation and active investigations of the waters of central and northern Alabama have enabled him to lay the naturalists of this country under many obligations by new discoveries, and this is certainly one of much importance. We now see for the first time that this genus, which is common in Europe, Africa, Asia, South America, and the West Indies, also inhabits our southern rivers. I have great pleasure in naming the species after the discoverer. This species is not allied to any which has come under my notice. It is more rotund than usual, has a clear horn-colored epidermis, smooth and shining. The substance of the shell is so thin as to permit the column to be visible through it. The inner lip is broad and slightly notched where it is in contact to the body whirl. It is to be regretted that among the four specimens sent to me by Dr. Showalter neither had an operculum. The soft parts have not yet been observed. (*Lea.*)

Neritina showalteri, LEA, Pr. Acad. Nat. Sc. Phila. 1861, 55; Journal [n. s.], V, pt. 3, 267, pl. xxxv, f. 78, 78*a* (Mar. 1863); Obs. IX, 89.

I can add nothing to the knowledge of this species contained in Mr. Lea's description copied above. One of his figures is copied in my Fig. 212.

Neritella jayana, RECLUZ.—Shell rather small, transversely-ovate, thin, concentrically and delicately striated, yellowish under the epidermis, varied with delicate angularly-flexuose, reticulated, small black lines and small white spots; behind generally of an uniform black; whirls three, almost conic above, and with a narrow canaliculated suture; spire inclined towards the side; labium compressed, white with black spots, edentulate and scarcely arched in the centre; labrum greenish-yellow. Height 4½, breadth 6, thickness 3 mill.

Fig. 213.

Neritina jayana.

North America?

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We are indebted for this little species to Dr. Jay, of New York, in whose honor it is named. It cannot be confounded with the European species *N. fluviatilis*—of which it is the American analogue—not only on account of its constant coloration, but still more on account of its conical spire and canaliculated suture. (*Recluz.*)

Neritina jayana, RECLUZ, Journ. de Conch. I, 157, pl. vii, f. 13 (1850).

I am unable to add any information regarding this species or its habitat, further than what is contained in the above copy of the original description and figure.

SPURIOUS SPECIES OF NERITELLA.

Neritina striata, BESLERI, from New Orleans is quoted in the synonymy of *Neritina zebra*, BRUG., of Cayenne, by RECLUZ, in Journ. de Conch. I, 152, and

Neritina zigzag, SOWERBY, from Florida, as a synonym of *Neritina lineolata*, LAM., of Cayenne. I can find no description or further information regarding the former, or any authority for the habitat given of the latter.

FAMILY HELICINIDÆ.

Lingual membrane long, narrow, with numerous longitudinal series of teeth, arranged 00, 5, 1, 5, 00; see description of *Helicina orbiculata*, on p. 108. Head proboscidiform; tentacles subulate, with the eyes at their outer bases. Foot elongated. Operculum non-spiral, annular, semi-oval or subtriangular, with concentric elements, thick and testaceous, or thin and horny. Shell with the aperture semilunar.

HELICINA, LAM.

Animal long, heliciform, tentacles slender, drooping, eyes at their external base; proboscis truncated. Operculum non-spiral, somewhat semioval, membranous or testaceous. Shell heliciform, turbinate, globose or depressed, base callous around the columella, which is somewhat flattened, and rather straight; aperture tri-

Fig. 214.

Head of *Helicina orbiculata.*

Fig. 215.

Operculum of *Helicina.*

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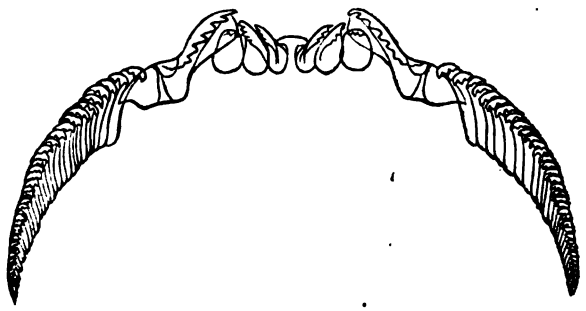
angularly semioval, entire; peristome simple, straight or thickened, often widely expanded. No horny jaw. Lingual mem-

Fig. 216.



Lingual dentition of *Helicina orbiculata*.—[TROSCHEL.]

brane with teeth arranged 00, 5, 1, 5, 00. Centrals small, apex broad, reflected; first and second laterals broader, rounded at base, apex recurved, denticulated; third lateral suboval, apex recurved, denticulated; fourth lateral long, narrow, irregular shaped, apex recurved, denticulated; uncini long, narrow, apex recurved, denticulated.

SUBGENUS OLIGYRA, SAY.

Shell subglobose or conic; spire equalling or excelling the last whirl, whirls ecarinate; peristome expanded.

Helicina orbiculata, SAY.—Shell subglobose, acute at apex, solid, smooth, very delicately striated; color yellowish, brownish, or ash-colored, with a linear, pale zone at the periphery, which passes up the spire at the suture, and makes it white; there are also in many specimens numerous capillary zones, and some specimens are mottled with pale spots; whirls five, well rounded, suture well impressed; aperture rather large, semilunar; peristome white, moderately reflexed, and often greatly thickened and protruded by age; columella short, joining

Fig. 217.

Helicina orbiculata, enlarged.

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the peritreme at nearly a right angle, and forming thereby a denticular protruberance; base delicately enamelled. Diameter 9, height 6 mill.

Helicina (*Olygyra*) *orbiculata*, SAY, Journ. Phila. Ac. I, 283; Nich. Encycl. ed. 3; Am. Conch. 5, pl. xlvi, f. 1–3; ed. BINNEY, 36, pl. xlvi, f. 1–3; ed. CHENU, Bibl. Conch. III, 58, pl. xv, f. 2, 2 *a*, 2 *c*.—GRAY, Zool. Journ. I, 70.—BINNEY, T. Moll. II, 352, pl. lxxiii, lxxiv, f. 3.—DEKAY, N. Y. Moll. 82 (1843).—CHEMNITZ, ed. 2, 74 (1846), pl. x, f. 32, 33.—PFEIFFER, Mon. Pneum. Viv. I, 375; II, 199 (excl. *H. rubella*).—GRAY & PFEIFFER, Brit. Mus. Phan. 272 (not of SOWERBY).—W. G. BINNEY, T. M. IV, 193, pl. lxxv, f. 18–20.

Helicina tropica, JAN in CHEMNITZ, ed. 2, p. 37, pl. iv, f. 9, 10.—PFEIFFER, Mon. Pneum. Viv. I, 375; II, 199.—GRAY & PFEIFFER, Brit. Mus. Phan. p. 271.—W. G. BINNEY, T. M. IV, 194.—TROSCHEL, Gebiss d. Schn. p. 81, pl. v, f. 9.

Helicina ambeliana, SOWERBY, Thes. Tab. 8, pl. i, f. 19 (1842), not ROISSY.

Helicina castanea, SOWERBY, *l. c.*, 13, pl. i, f. 31, 32.

Helicina vestita, GUILDING in SOWB., *l. c.*, p. 14, pl. i, f. 42.

Helicina minuta? SOWERBY, *l. c.*, f. 40, 41.

Texas to Georgia; Tennessee to Florida. Also in the post-pleiocene of the Mississippi Valley.

Animal (see Fig. 214): Head and tentacles black, the other parts of the body dark. Tentacles long and slender, tapering to a point. Eyes black and prominent. Motion gliding as in *Helix*. Operculum horny, turning back upon the columella as if upon a hinge.

This species seems to be distributed over a very wide extent of territory, and also to be subject to great variations in size and coloring. From specimens collected in company, within a very small area, individuals might be selected differing so widely from each other that no one would hesitate to regard them as very different species, unless their history were known.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8143	5	Texas.	G. Wurdemann.	.....
8144	1	.....	.....	.....
8145	3	St. Simon's Island, Ga.	Dr. J. Lewis.	.....
8339	3	.....	W. G. Binney.	Cabinet series.
8416	75	Texas.	Lieut. Couch.	(*H. tropica.*)
8417	22	Indianola, Tex.	.....	"
8418	44	Tamaulipas, Mex.	Lieut. Couch.	"
8419	2	"	"	"
8338	5	Texas.	W. G. Binney.	" Cab. ser.
8509	300?	"	"	"
8962	..	Hot Spr., Ark.	Dr. B. Powell.	.....

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Helicina hanleyana, Pfr.—Shell globose-conic, rather solid, marked with impressed concentric, rather spaced lines; scarcely transparent, shining, reddish horn-colored; spire shortly conic, obtuse; whirls five, scarcely convex, the last rounded, slightly descending before; aperture slightly oblique, sub-semicircular; columella very short, denticulated without, with a diffuse, light white callus; peristome white, scarcely expanded, thickened within, ending in a basal columellar denticle. Greater diam. 7½, less 6½, height 5⅔ mill.

Fig. 218.

Helicina hanleyana.

Helicina hanleyana, Pfeiffer in Proc. Zool. Soc. 1848, 122; Mon. Pneum. Viv. I, 376.—Chemnitz, ed. 2, 45, pl. ix, f. 7, 8.—Gray and Pfeiffer, Brit. Mus. Phan. 302.—W. G. Binney, T. M. IV, 192, pl. lxxv, f. 14, 16.

Near New Orleans.

Helicina chrysocheila, Binney.—Shell broad conic, or pyramidal, thin, shining, pale yellow, with the surface finely shagreened with microscopic, punctured lines; spire elevated, whirls five, moderately convex, the last one somewhat flattened at base and indistinctly angular at the periphery; aperture large, very oblique, semi-oval, the diameters about equal; the peristome broadly everted, especially at its middle portion, narrow and simple at its columellar junction, of a golden-yellow color; parietal callus extended, of a deep orange color. Diameter 10, height 8 mill.

Fig. 219.

Helicina chrysocheila.

Helicina chrysocheila, Binney, Terr. Moll. II, 354, pl. lxxiv, f. 4.—W. G. Binney, Terr. Moll. IV, 192.—Pfeiffer, Mon. Pneum. II, 197 (not of Shuttleworth).

Texas and Tampico in Mexico.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8535	1	Texas.	G. Wurdemann.	Cabinet series.
8536	..	Tamaulipas, Mex.	Lieut. Couch.	"

Helicina subglobulosa, Poey.—Shell globose-conic, solid, lightly striate, rather shining, uniformly white, or marked with two red bands, one broad near the suture, other narrow, near the periphery; spire convex-conic, rather sharp; whirls six, the upper ones flattened, the penultimate

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more convex, subtriangulate, the last subcarinate, rather convex below; columella short, arched, dilated, marked with a white line, and covered with a light callus; aperture rather oblique, irregularly semioval; peristome wide, angularly spreading, sub-excavated, narrowing at each extremity. Greater diam. 10, lesser 8½, height 7 mill. (*Pfeiffer.*)

Fig. 220.

Helicina subglobulosa.

Helicina subglobulosa, Poey, Mem. I, 115, 120, tab. xii, f. 17–21.—Pfeiffer, Malak. Blatt. 1854, 107; 1856, 146; Mon. Pneum. Viv. II, 209.—W. G. Binney, T. M. IV, 195, pl. lxxv, f. 17.

Fort Dallas and Key Biscayne, Florida. Also Cuba.

The specimens received may, perhaps, be referable to *Hel. subdepressa*, Poey.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8540	1	Fort Dallas, Fla.	W. G. Binney.	Cabinet series.

Spurious Species of Helicina.

Helicina fastigiata and *plicata* of DeKay, N. Y. Moll. 82, are respectively *Helix fastigans* and *Helix hazardi.*

Fossil Species of Helicina.

Helicina occulta, Say.—Shell small, rather solid, low conical, acute at apex, cretaceous, obviously striated; spire of five nearly plane whirls, the last of which is angular at the periphery, and this angle continuing up the spire adjacent to the suture, makes it appear double; the aperture is small, semilunar; the peristome is scarcely reflexed, but is thickened internally; the columella is very short, and joins the peristome by a slightly waving curve, without forming an angle. Diameter 6, height 5 mill.

Fig. 221.

Helicina occulta.

Helicina occulta, Say, Transylv. Journ. of Med. IV, 528 (1831); Descr. of New Terr. and Fluv. Shells (from the Diss.), p. 15 (1840); Am. Conch. V, pl. xlvi, f. 4–6 (1832): ed. Binney, p. 37, pl. xlvi, f. 1–3.—Binney, Terr. Moll. U. S. II, 356, pl. lxxiv, f. 1, 2.—DeKay, N. Y. Moll. 82 (1843).—Pfeiffer, Mon. Pneum. Viv. I, 347.—Chemnitz, ed. 2, 18 (1846), pl. iv, f. 11, 12 (1850).—Gray &

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PFEIFFER, Brit. Mus. Phan. 250.—W. G. BINNEY, T. M. IV, 193.

Helicina rubella, GREEN, in Doughty Cat. II, 291 (1832).

Very plenty in the postpleiocene beds of the West.

Cat. No.	No. of Sp.	Locality.	From whom rec'd.	Remarks.
8442	1	Sheboygan, Wis.	I. A. Lapham.	Fossil. Color remain-
8337	2	.....	W. G. Binney.	" Cab. ser. [ing.
8805	1	.....	W. Stimpson.	"

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APPENDIX TO VIVIPARIDÆ, ETC.

Since the first portion of the preceding pages was printed the following additional species have been received:—

Pomus depressa. (Page 3.)

I am now able to give a figure of the jaws of this species.

Fig. 222.

Jaws of *Pomus depressa*. *a*. Top view. *b*. Side view.

Valvata pupoidea, GOULD. (Page 13.)

A better view of this species than Fig. 19 is here given.

Fig. 223.

Valvata pupoidea.

Page 14. The description of *Valvata humeralis* should have been accredited to Say.

Vivipara contectoides. (Page 23.)

The figure of this species here given is to be substituted for that given on page 23, which incorrectly shows but three revolving bands. There are invariably four on all the specimens I have examined.

I neglected to state in the text that I did not adopt *linearis* as the specific name in this case, because it was probably a typographical error for *lineata* in Küster's monograph, and because it does not apply to the shell in question.

Fig. 224.

Vivipara contectoides.

Vivipara inornata.—Shell minutely perforated, globose-conic, thin, smooth, polished, lines of growth extremely delicate on the body whirl, imperceptible above; color uniformly greenish or pale olive, unadorned with any revolving lines; the suture impressed, spire short, conical;

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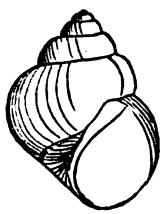
apex acute, distinct, not truncated; whirls regularly increasing, inflated, the last globose, equalling about two-thirds of the shell's length; aperture oblique, rounded, large; lip continuous in one plane; peristome thin, acute, continuous; columellar extremity appressed to the body whirl, almost entirely concealing a minute umbilicus; parietal wall of the aperture covered with a thin, shining, colorless callus. Length of axis 19 mill., breadth 17 mill.

Fig. 225.



Vivipara inornata.

Near Chopatilo, Mexico.

Vivipara inornata, W. G. Binney, Am. Journ. Conch. I, 49, 1865, pl. vii, f. 1.

It is after a very careful examination of the specimens brought from Chopatilo, that I have decided to propose for them a specific name. Having submitted them to several experienced Conchologists, I find my decision approved by them. It can be compared with no known American form.

The smooth, polished surface, unbroken by revolving lines, the pale olive color and acute apex, are the more prominent features of it.

About a dozen specimens were brought. On one is an obtuse, ill-defined carina on the middle of the body whirl.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9168	1	Near Chopatilo, Mex.	.....	Type.
9218	2	"	.....	.....

Fig. 226.

MELANTHO. (Page 35.)

Melantho, Bowditch.

Bowditch thus describes and figures *Melantho* as a subgenus of *Melania* (Elem. Conch. 1822, p. 27, pl. iv, f. 15):—

Peristome incomplete, not effusive; very thick; white. Subglobular. Marine.

Melantho decampi, Currier.—Shell ovate, oblong, imperforate, rather thick, irregularly roughened by occasional coarse wrinkles of growth, decussated by delicate revolving and longitudinal striæ; greenish olive, with revolving dark broad lines when young, darker when old; suture impressed, spire elevated, but truncated; remaining whirls three, of which the two upper are flattened, the lower sub-convex, with a median obtuse

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carina, reaching to, and modifying the peristome; aperture higher than broad, roundly lunate, produced below; bluish within; peristome simple, acute, sinuous, angular above at the termination of the carina. Greater diameter, including aperture, 22 mill., length 35 mill.; length of the aperture 20 mill., diameter 10 millimetres.

Fig. 227.

Melantho decampi.

Operculum horny, concentric.

Melantho decampi, W. G. BINNEY, Am. Journ. Conch. I, 49, 1865, pl. vii, f. 2, 3.

Fig. 228.

Operculum of *Melantho decampi.*

Huntsville or Stevenson, Alabama: Dr. W. H. DeCamp, 1st Michigan Vol. Engineers.

This species was given me by Mr. A. O. Currier, of Grand Rapids, Michigan, who suggested its bearing the name of its discoverer.

Fig. 229.

Melantho decampi.

About a dozen specimens were collected. All but the one drawn in Fig. 227 could not be distinguished from *Melania* without the presence of the operculum, thus furnishing another example of the impossibility of ascertaining from the shell alone the generic position of some species. It is probable that other species of *Melantho* have been described as *Melaniæ.*

Fig. 227 was photographed from nature on wood. It represents the largest and oldest specimen. Fig. 229 is drawn from a younger individual.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9309	2	Huntsville or Stevenson, Ala.	Currier.	Type. Fig. 227–9.

Gillia ——?

Fig. 230.

Gillia ——?

From Stephenson, Ala., and Powel's River, Tenn., has lately been received a new species of *Gillia*, here figured.

On page 63. *Paludina altilis* should have been referred to *Gillia.*

Paludina pallida, subglobosa, fontinalis, and *isogona* to *Somatogyrus isogonus.*

Paludina lustrica to *Pomatiopsis.*

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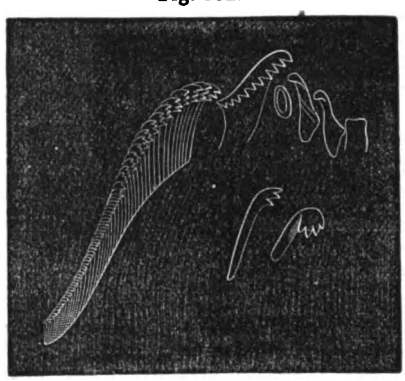
Fig. 231.

Helicina ——— ?

Helicina ——— ?

The Smithsonian Institution has just received from Mr. Xantus a specimen of *Helicina* from the Sierra Madre. I do not propose a name for it, as it may already have been described in Europe A figure is here given, almost twice the natural size, and a figure of the lingual dentition.

Fig. 232.



Lingual dentition of *Helicina* ——— ?

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RESEARCHES

UPON THE

HYDROBIINÆ

AND ALLIED FORMS;

CHIEFLY MADE UPON MATERIALS

IN THE

MUSEUM OF THE SMITHSONIAN INSTITUTION.

BY

DR. WILLIAM STIMPSON.

WASHINGTON:

SMITHSONIAN INSTITUTION.

AUGUST, 1865.

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ADVERTISEMENT.

THIS memoir gives the results of an investigation relative to the structure of a group of small and little-known Gasteropods, which Dr. Stimpson has undertaken with a view to their classification, and arrangement in the museum of the Institution. It is thought that these results may also be useful in the arrangement of other collections of this group of Mollusks.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION,
WASHINGTON, August 30, 1864.

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RESEARCHES

UPON THE

HYDROBIINÆ

AND ALLIED FORMS.

INTRODUCTORY REMARKS.

ABOUNDING in the fresh waters of North America, and in some instances upon land contiguous to fresh water, there are to be found species of minute shells resembling the *Vivipari* in form, but differing from them in the spiral form of the operculum. Some of these shells have been erroneously referred to the genera *Paludina*, *Melania*, *Leptoxis*, and *Cyclostoma*. To others the generic names *Amnicola*, *Pomatiopsis*, *Somatogyrus*, and *Chilocyclus* have been applied. They must all, I believe, be referred to the extensive family RISSOIDÆ, a group of gasteropods remarkable for their small size, which are very generally distributed throughout the globe, and are very numerous in the sea, as well as in fresh waters.

The Rissoidæ were very properly separated as a family from the Littorinidæ by H. & A. Adams,[1] but the characters given by these naturalists are not entirely satisfactory. The character "rostrum more or less adnate, below, to the fore-part of the foot," is not a constant or general one, and some of the others given by them are only partially distinctive, and can scarcely be relied upon for the discrimination of families. The true distinction between this group and the Littorinidæ is found in the shape and position of the teeth on the lingual ribbon.

The Messrs. Adams include in their family Rissoidæ the genera *Rissoina*, *Rissoa*, *Alvania*, *Onoba*, *Barleeia*, *Ceratia*, *Setia*, *Cingula*, *Hydrobia*, *Skenea*, and *Amnicola*. These are all probably true Rissoids with the exception of *Barleeia*, which belongs to

[1] Genera of Recent Mollusca, I, 327.

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a distinct family. But there are several genera to be added to this list, which will be named further on in this paper. It may now be mentioned, however, that *Lithoglyphus* and *Paludestrina*, placed by the Messrs. Adams in the Littorinidæ, must be included here, since they have the lingual dentition of the Rissoidæ, the characteristic of which, as shown by Troschel, consists in the presence of basal denticles on the rhachidian tooth. We also add *Bythinella* of Moquin-Tandon, usually considered as synonymous with *Hydrobia*, or with *Amnicola*, but sufficiently distinct. And the genus *Pyrgula* of Christofori & Jan, found in the streams of Switzerland, probably also belongs here, although hitherto referred by most authors to the Melaniidæ.[1] The same may be said of *Tricula*, Benson, found in the rivers of India. A. Adams has also added *Fenella*. The probabilities of the genera *Cecina* and *Blanfordia*, A. Ad., and *Cremnobates*, Blanford, also belonging here, will be discussed further on.

Troschel[2] suggests the inclusion in the family of his groups "Bythiniæ, Lithoglyphi, and perhaps Truncatellæ," which would require the addition of the genera *Bythinia*, *Stenothyra*, *Assiminea*, *Tomichia*, and *Truncatella*. The two first named are rightly, I think, here placed, in view of the structure of the male organ and the lingual teeth; but *Assiminea* differs conspicuously in the position of the eyes, and *Tomichia* and *Truncatella* both in the position of the eyes and in the structure of the breathing organs.[3] Gray[4] includes in the family only three genera, *Rissoina*, *Rissoa*, and *Skenea*;—*Lithoglyphus*, *Hydrobia*, and *Amnicola* being by him wrongly placed in the Littorinidæ.

The following is offered as an amended character of the family Rissoidæ, which will serve to distinguish it from the groups allied to it, or with which it has been confounded, as the Littorinidæ, Viviparidæ, Truncatellidæ, Melaniidæ, Valvatidæ, etc.:—

---

[1] Bourguignat has already recognized the affinity of *Pyrgula* to *Hydrobia*, although he incorrectly places both these genera in the Viviparidæ (Guerin's "Revue et Magasin de Zoologie [2], XIII (1861), p. 523).

[2] Gebiss der Schnecken, I, 106.

[3] It may also be remarked that the dentition of the Truncatella group is characterized by the presence of a transverse, continuous, dentated plate beneath the cusp on the rhachidian tooth, which occurs in none of the Rissoidæ.

[4] Guide to the Systematic Distr. of Mollusca, etc., I, 96.

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Tentacles elongated, with the eyes at their outer bases. Verge (male organ) exserted, situated on the back at a considerable distance behind the right tentacle. Gills both pallial; the right or principal one usually rather short and broad, and composed of few laminæ, which are much broader than high. Foot oblong, truncate before, rounded or pointed behind. Operculigerous lobe well developed. Operculum horny or partly shelly, spiral or concentric. Lingual teeth 3. 1. 3; the rows being more transverse and less arcuated than in the Littorinidæ. Rhachidian tooth broader than long, and armed with basal denticles (so called by Troschel) on each side, which may be either on the basal margin, or on the anterior surface of the tooth above the base; cusp recurved and denticulated. Intermediate tooth more or less hatchet-shaped, having a handle-like process (peduncle) projecting outwardly from the base of the broad body which is denticulated at the upper margin. Lateral teeth generally slender and armed with numerous minute denticles at their superior margins. Shell small, spiral, turreted or depressed, often more or less umbilicated; aperture more or less rounded, never truly channelled in front; peritreme continuous. Station in fresh, brackish, or sea water, rarely on land. Distribution mundane.

The family Rissoidæ, as now circumscribed, notwithstanding their agreement among themselves in all characters which are of importance for the discrimination of the family, yet present such considerable differences in minor details, that they are found to arrange themselves naturally into several distinct groups, or subfamilies. We find genera in which the shell is turreted and elongated, and others in which it is globular or depressed; some in which the verge is bifid, and others in which it is simple; some which have long proboscidiform snouts, and others with extremely short ones; some with lateral sinuses in the foot, and others without them; some with the foot produced anteriorly, and others having it shorter than the snout; some with a cirriform appendage to the operculigerous lobe, and others without; some with a spiral, others with a concentric operculum; and these differences are in some cases coincident with the great diversity in station and habits which we observe among these little snails. As already noticed, they inhabit the greatest possible variety of station, some of the genera being marine, and living even at great depths in the

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ocean, while others live in brackish water, many in fresh water, and one, at least, habitually on land.

Upon these grounds I would suggest the division of the family into the following subfamilies, using the characters of the soft parts, as well as those of the shell and operculum :—

BYTHINIINÆ, with an ovate shell, a concentric operculum which is calcareous within, and with cervical lobes. They are comparatively large. Fresh water. Genus *Bythinia*,[1] Gray.

RISSOININÆ, with an ovate or turreted shell, and a thick, corneous, subspiral operculum provided with an internal process (articulated). Size small. Marine. Genus *Rissoina*, D'Orb.

RISSOINÆ, with an ovate or elongated shell, and a subspiral operculum not provided with a process. Foot without lateral sinuses. Rhachidian tooth of the lingual ribbon with the basal teeth on the inferior margin. Size small. Marine. Genera *Rissoa*, Frem., *Cingula*, Flem., *Alvania*, Risso, *Onoba*, H. & A. Ad., *Setia*, H. & A. Ad., *Ceratia*, H. & A. Ad., *Fenella*, A. Ad.

SKENEINÆ, with a depressed, almost discoidal shell, and a corneous, paucispiral[2] operculum. Minute. Marine. Genus *Skenea*, Flem.

HYDROBIINÆ, with shell and operculum and foot like those of the Rissoinæ, but with the rhachidian tooth of the lingual ribbon having the basal teeth on the anterior surface, behind the lateral margins. Size variable; some are minute, some as large as Bythiniæ. Living in fresh or brackish water. Genera *Hydrobia*,[3] Hartm., *Littorinella*, Braun, *Amnicola*, Gould & Hald., *Bythinella*,[4] Moq.-Tand., *Stenothyra*,[5] Benson, *Tricula*, Benson, *Pyrgula*, Christ. & Jan., *Paludestrina*, D'Orb., *Tryonia*, Stm., *Potamopyrgus*, Stm., *Lithoglyphus*, Muhlfeldt, *Fluminicola*, Stm., *Gillia*, Stm., *Somatogyrus*, Gill, *Cochliopa*, Stm.

POMATIOPSINÆ, with the shell and operculum as in the Rissoinæ. Foot with lateral sinuses. Size small. Amphibious. Genus *Pomatiopsis*,[6] Tryon.

---

[1] Syn. *Elona*, Moq.-Tand.

[2] According to the terminology of Woodward, the operculum of *Skenea* would be multispiral, and that of the Rissoinæ, etc. paucispiral.

[3] Syn. *Paludinella*, Lovèn (not Pfeiffer), and *Littorinida*, Eyd. & Soul.

[4] Syn. *Leachia*, Risso (not Lesueur), *Microna*, Ziegler.

[5] Syn. *Nematura*, Benson.

[6] Syn. *Chilocyclus*, Gill.

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The above mentioned characters may be tabulated as follows:—

A. Operculum concentric . . . . . BYTHINIINÆ.
B. Operculum spiral.
  a. Operculum pauci-spiral . . . . . SKENEINÆ.
  b. Operculum subspiral.
    1. Operculum with an internal process . . RISSOININÆ.
    2. Operculum without an internal process.
      * Foot without lateral sinuses.
        † Rhachidian tooth of the lingual ribbon with the basal denticles on the inferior margin . . . . . RISSOINÆ.
        †† Rhachidian tooth of the lingual ribbon with the basal denticles on the anterior surface behind the lateral margins . . . . . HYDROBIINÆ.
      ** Foot with lateral sinuses . . . . POMATIOPSINÆ.

It is with the two subfamilies last mentioned that we have to do in the present paper: the HYDROBIINÆ and POMATIOPSINÆ.

I adopt, for several reasons, the name Hydrobiinæ for the first of these subfamilies in preference to that of Amnicolinæ, proposed by Mr. Gill[1] for a part of the group, to which some Pomatiopsinæ were added. First, because the group was first indicated by Troschel,[2] under the name Hydrobiæ; next, because the first genus of the subfamily ever described was called *Hydrobia*; and lastly, because the name Amnicolinæ is not universally applicable, since these animals are not all inhabitants of rivers, or even of fresh-water, some of them living in shallow inlets of the sea. The name Hydrobiinæ is in every respect appropriate.

J. D. W. Hartmann was the first to separate these little snails from the old heterogeneous group called *Paludina*. According to Herrmannsen[3] he published the genus *Hydrobia* in 1821, in Sturm's "Fauna Deutschlands," Abth. VI, Heft 5, p. 46. I have been unable to find and consult this work for the purpose of ascertaining the type of the genus, but the author doubtless intended to include in it both fresh-water and marine forms, certainly fresh-water ones, as he again used the generic name (*fide* Herrmannsen) in a treatise on the land and fresh-water shells of Switzerland, in Steinmuller's "Neue Alpina," I, 258. Moquin-Tandon[4]

[1] Proc. Acad. Nat. Sci. Philad., 1863, p. 34.
[2] Gebiss der Schnecken, I, 106 (1857).
[3] Ind. Generum Malacozoorum, I, 545.
[4] Hist. Nat. des Moll. ter. et fluv. de France, II, 514.

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says that Hartmann originally included but three species in his genus, one of which was marine; and rejects the name *Hydrobia*, "because it had already been applied by Leach to a genus of insects." But the name of the coleopteran genus is *Hydrobius*, and sufficiently distinct to avoid confusion. Gray[1] gives the *Turbo ulvæ* of Pennant, a marine species, as the type of the genus *Hydrobia*, in which he is followed by Woodward[2] and H. & A. Adams.[3] I shall therefore retain the name for the marine species (included in *Rissoa* by Forbes & Hanley) until further bibliographical researches can be made. That the marine, or rather brackish-water forms truly belong to the same group with the fresh-water species—the Amnicolæ, etc.—is evident from the character of their lingual dentition, which I have recently examined in the *Littorinella minuta* (*Cingula minuta*, Gould) of the coast of Massachusetts. The other characters of this animal are also so similar to those of the fresh-water forms, both in shell and soft parts, that it would, if found in fresh water, be considered by many as an elongated *Amnicola*. The verge is simple as in some of the fresh-water genera to be described below.

In Sturm's "Fauna Deutschlands," Hartmann also published a second genus under the name of *Lithoglyphus* (the MSS. name of Muhlfeldt), which proves to belong to the Hydrobiinæ, the type being the *Paludina naticoides* of Ferussac, found in the Danube.

The small mollusks of the families Hydrobiinæ and Pomatiopsinæ are not only numerous, but greatly diversified in form, in the fresh waters of North America. They may be distinguished from all the rest of our fluviatile gasteropods, with some groups of which they have often been confounded, by the presence of an external verge, coexistent with a corneous subspiral operculum.

Like the Vivipari and Melaniæ, they have recently received considerable attention from American naturalists, particularly in respect to their classification, which has been attempted upon various grounds, but, as it would seem, with indifferent success. In fact but little dependence can be placed upon the shell alone, in the systematic study of these groups; the entire animal must be examined for the discovery of the most important characters.

[1] Turton's Manual, 2d ed., 1840, pp. 87, 88.

[2] Manual of the Mollusca, p. 137.

[3] Genera of Recent Mollusca, I, 335.

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Having recently found some of these animals living in the District of Columbia, and received from my friends Messrs. Binney, Tryon, and others, numerous specimens preserved in spirits from other parts of the country, I have been able conveniently to study their structure and habits, with the view of determining their relations to each other and to neighboring groups. Before giving the results of this study, it will be proper to review what has been already published upon the subject in this country.[1]

Mr. S. S. Haldeman and Dr. A. A. Gould were the first in this country to call attention to the generic distinctness of certain small shells previously referred to *Paludina*, to include which they proposed to establish a new genus, *Amnicola*. This genus was first published by the former gentleman in October, 1840, in a "Supplement to a Monograph of the Limniades," p. 3, as follows: "*Amnicola*, G. & H. Head proboscidiform; shell like *Paludina*, opercule corneous and subspiral." No species was mentioned as the type, or even as an example. Dr. Gould, in his celebrated work, the "Invertebrata of Massachusetts," 1841, pages 228 and 229, gave a much more detailed description, pointing out other important characters in which the genus is distinguished from *Viviparus*, such as the production of the rostrum beyond the foot, certain peculiarities in the habits of the animal, etc. He states that "so far as observation has yet gone, the *Amnicola* is oviparous, while the true *Paludina* is ovo-viviparous;" and also remarks that the tentacles are "frequently, if not always, unequal in length; perhaps this is a sexual difference." The difference in the length of the tentacles is, however, purely accidental. Dr. Gould's description of the animal is excellent, though relating

[1] In some of the papers referred to below I find allusions to a work by Mr. Binney. As an excuse for not herein referring to such a work, I can only say that I am unaware that Mr. B. has published anything whatever upon the subject. I have, indeed, in common with some others interested in the subject, received certain *printer's proof-sheets* of a forthcoming work on the Amnicolæ, Vivipari, etc., to be published by the Smithsonian Institution. The distribution of these proofs, with the view of eliciting additional information, speaks well for Mr. Binney's carefulness and strong desire to perfect his work; but we should no more quote publicly his unmatured views, confidentially circulated in the form of proof, than we should a private letter.

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only to those parts of the animal which are protruded from the shell in progression.

Haldeman, in his "Monograph of the genus *Amnicola*," which forms part of his beautiful work on the fresh-water gasteropods of North America, also gives a description of the animal, in which he adds nothing of importance to that of Dr. Gould, except short accounts of the gills and of the character of the ova, which do not accord with my own observations as detailed below.

Dr. Lewis, in the "Proceedings of the Boston Society of Natural History," Vol. VIII, 1861, p. 255, gives a description of the so-called *Amnicola lapidaria*, stating that the soft parts of this species are "identical in form with *Melania*," and subsequently, in the "Proceedings of the Academy of Natural Sciences of Philadelphia" for 1862, p. 590, gives a more detailed account of the animal, and points out certain resemblances to *Melania* and *Truncatella*. But, as has been elsewhere noticed,[1] its resemblance to the Melanians is only a superficial one, and it is far removed from that group in the structure of its generative organs. To the Truncatellæ the species indeed shows a strong likeness in form and habits, which Dr. Lewis was the first to detect, although Say had indeed placed it in *Cyclostoma*. But its respiratory organs are of a different type, "*Amnicola*" *lapidaria* being a true Ctenobranchiate, while the Truncatellæ, as far as known, are air-breathing mollusks.

In a paper published in the "Proceedings of the Academy of Natural Sciences of Philadelphia" for September, 1862, Mr. Tryon has elevated the group Amnicolæ to the rank of a family, under the name of Amnicolidæ, but as this author has given no diagnosis of the group thus proposed, we are ignorant of the grounds upon which he considered it distinct from the allied families already known and named. He mentions but a single genus, *Amnicola*, but proposes under it a subgenus, *Pomatiopsis*, for the elongated species, with *A. lapidaria* for an example. This species, however, is not congeneric with the other elongated forms; it being found upon examination to present structural peculiarities which separate it widely from all of the true Amnicolæ.

The subject has since been investigated by my friend Prof. Theodore Gill, of the Smithsonian Institution, whose views are

[1] Am. Journ. of Science and Arts, [2] xxxviii (1864) 50.

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published in the same "Proceedings," for the month of February, 1863, in a paper entitled a "Systematic arrangement of the Mollusks of the family Viviparidæ and others, inhabiting the United States," which has great value as calling attention to the true generic characters of the shell in several groups hitherto little understood or not generally accepted. This naturalist first called attention to the general correlation of size with structure in the families he describes. He agrees with Mr. Tryon in the separation of the Amnicolæ as a distinct family, Amnicolidæ, to which he gives, however, a much greater extent, by including in it the European *Bythinia*, and the *Bythinella* of Moquin-Tandon, which genus he regards as identical with *Amnicola* proper. He thus follows Moquin-Tandon in approximating these two groups, which have been widely separated by others; but, apparently recognizing the value of the great difference in the form of their opercula, he proposes to place them in two distinct subfamilies, Bythininæ and Amnicolinæ.[1] In the latter group he includes three genera, *Amnicola*, G. & H., *Somatogyrus*, n. g., and *Chilocyclus*, n. g. The subgenus *Pomatiopsis* of Tryon he rejects as doubtful; this group, however, in view of the characters of its type *P. lapidaria*, must be accepted, and *Chilocyclus* of Gill is synonymous with it.

Mr. Gill gives a diagnosis of the proposed family "Amnicolidæ" as follows:—

"Family Amnicolidæ (Tryon), Gill. Animal oval or elongated, completely retractile within its shell. Foot oval or rounded, generally narrow, and not continued in front of the rostrum. Jaws obsolete. Tentacles cylindrical setaceous, pointed, with the eyes sessile at their postero-external bases. Branchiæ in a single row, in the form of transverse folds, somewhat dilated at the middle. Generative organs on the right side; verge external, behind the tentacle, bifid and with unequal branches; female orifice under the margin of the mantle, on the same side."[2]

The author states that his knowledge of the anatomical characters is chiefly due to Moquin-Tandon, and it will be noticed that this is an exact translation of Moquin-Tandon's description of the

[1] Proc. Acad. Nat. Sci. Philad., 1863, p. 34. The presence of cervical lobes in *Bythinia* is another important point in which it differs from the Amnicolæ, etc.

[2] Proc. Acad. Nat. Sci. Philad., 1863, p. 35.

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soft parts of his genus *Bythinia*[1] (in which he includes not only the true Bythiniæ but the Bythinellæ also[2]), except in leaving out the expression "à tortillon spiral," in relation to the entire animal, and in the substitution of the more nearly exact term "Jaws obsolete" for "Mâchoires nulles." The characters are used for the group originally founded upon our American *Amnicola*, on the assumption that our American species agreed therein with the European forms studied by Moquin-Tandon. The diagnosis will not, however, apply to our American forms as a group. The foot is by no means "narrow" in the greater part of our species. The jaws are not "obsolete;"—I have found them present and sufficiently well-developed in *Amnicola porata* and all others which have come under my observation.[3] The tentacles are not "setaceous, pointed," in *Amnicola* proper, but conspicuously of equal size throughout their length, and truncated at their extremity. Finally, the verge is not bifid in all of our species.

Having eliminated these false characters, we can more easily determine whether these Amnicolæ, and their allies, are entitled to rank as a family distinct from the Rissoidæ, in which the typical forms were placed by H. & A. Adams. We find, however, no character left which will serve to distinguish them, with the exception of "foot not continued in front of the rostrum." But this character does not seem to be of sufficient importance to indicate the separation of the two groups as distinct families, when the agreement is so close in all other points. It is also a very uncertain character. In describing these animals, sufficient care has not been taken to mention their position or movement at the time the description is drawn up. Among the figures of Rissoæ in the great work of Forbes and Hanley on the British Mollusca, we find some species represented with the head in advance of the foot, and others with the anterior extremity of the foot in advance of the head. On the other hand, I have

[1] Mollusques terrest. et fluv. de France, II, 514.

[2] Moquin-Tandon's rather unnatural approximation of these two groups seems to have been chiefly founded on the similarity of their generative organs, which are strikingly different from those of *Viviparus*, to which genus the Bythiniæ were formerly referred.

[3] That they exist also in *Bythinia*, notwithstanding the statement to the contrary by Moquin-Tandon, has been discovered by Troschel (see "Gebiss der Schnecken," I, 162). Moquin-Tandon himself admits having found traces of them in *Bythinella viridis* (op. cit., II, 525).

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often seen the auricles of the foot in *Amnicola porata*, in certain positions, protruded beyond the snout, although their normal position is most certainly in the rear of the snout. Other distinctive marks, not mentioned by Mr. Gill, might be cited for the discrimination of the Amnicolæ from the Rissoæ, but none which, in my opinion, are of importance for *family* distinctions. The deep-water Rissoidæ have generally a caudal filament arising from the posterior extremity of the operculigerous lobe, but the shallow-water species are for the most part destitute of this appendage, although so closely allied to the others that Forbes and Hanley have not even generically separated them. The lingual dentition of the Amnicolæ is of the same type with that of the Rissoæ, the only essential difference being in the position of the basal denticles of the rhachidian tooth. There may be, indeed, characters remaining to be discovered, which will serve to separate the two groups as distinct families, but certainly none have as yet been brought forward.[1]

To conclude the history of the writings of American naturalists on mollusks belonging to the subfamily Hydrobiinæ, the paper of Dr. Lewis in the "Proceedings of the Boston Society of Natural History," IX, 161, February, 1863, may be noticed. He has given a short description of the soft parts of *Melania isogona*, Say, which he refers to *Amnicola*, as Dr. Lea had already done.[2]

My own investigations into the characters of the small North American Gasteropods usually referred to *Amnicola*, have led me to distinguish among them two distinct subfamilies, which have

[1] It may here be remarked that none of the authors quoted above have given us valid characters for the distinction of the *Amnicola* group from the Melaniidæ, in which family they are indeed included by Dr. Lea. Mr. Gill, in his Synopsis (loc. cit., p. 33), relies upon the obsolescence of the jaws (an error as shown above), the shape of the aperture, and the size of the shell; but neither of the last two characters will serve to distinguish our largest Amnicolinæ from certain Mudaliæ and Ancylosæ. The same may be said of the continuous peritreme of the aperture of the shell of the Amnicolinæ, the character usually relied upon by authors, although this latter has far more value than the others just mentioned. The real difference between the two groups is found in the generative organs, the male in the Melanians being destitute of an external verge. (See a paper "on the structural characters of the so-called Melanians of North America," in Silliman's "American Journal of Science and Arts," [2] XXXVIII, 41.)

[2] Tr. Am. Phil. Soc., IX, 16.

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been already briefly alluded to, viz. (1) the Hydrobiinæ, characterized by their purely aquatic habits, gliding motion, and the smooth sides of the foot, of which we find the genera *Bythinella*, Moq.-Tand., *Amnicola*, G. & H., *Gillia*, n. g., *Somatogyrus*, Gill, and *Fluminicola*, n. g., in the fresh waters of the United States; and (2) the Pomatiopsinæ, characterized by their terrestrial, or more properly amphibious, habits, stepping method of progression, and sinuated sides of the foot, with but one genus, *Pomatiopsis*.

I will now proceed to describe in detail such species of these two groups as have come under my observation, reserving the systematic diagnoses of the genera for the conclusion of the paper.

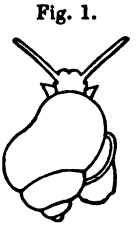
I. ON THE AMERICAN FRESH-WATER HYDROBIINÆ.

The considerations which have guided me in the selection of the family name, have been detailed on page 5.

Genus **AMNICOLA**, Gould & Hald.

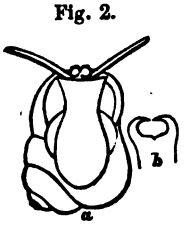
The following description of the characters of *Amnicola* proper is based upon the examination of a subglobular species (fig. 1) found in the Potomac River, which is probably the *Paludina porata* of Say, and undoubtedly congeneric with Gould's *Amnicola porata*, which Haldeman considers to be the *Paludina limosa* of Say, and which is the type of the genus, being the first species ever referred to it.

Fig. 1.



The foot (fig. 2, *a*, *b*) is simple, without any lateral sinuses, and is, when extended in progression, between two and three times as long as broad. It is dilated and auricled in front, somewhat narrowed before the middle, more or less expanded behind the middle, and rounded or subtruncate at the posterior extremity. The auricles are pointed, and generally project but little beyond the lateral margin; but under certain circumstances the animal can elongate them to such a degree that they become almost tentaculiform, and at least as long as the foot is wide. This is represented in the cut fig. 2, *b*. On one occasion I have seen the auricles thus remarkably protruded, and

Fig. 2.



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vibrated laterally until their tips met in front, and they inclosed a heart-shaped open space between their margins. Under some circumstances they are doubtless used as tactile organs. The anterior extremity of the foot, between the tips of the auricles, is bi-marginate, or divided into two lips by a slit or furrow of slight depth. The subtruncate posterior extremity of the foot sometimes takes an obscurely trilobate form, the middle lobe being broad and arcuated, while the small lateral lobes are dentiform. The operculigerous lobe is oval or rounded, not continued anteriorly, but broader than the foot, so that it projects on either side beyond the margin of the latter. The operculum is thin, horny, and subspiral, with about two turns and a half. It is striated, both longitudinally and transversely to the whorl, except at the outer or larger extremity, where the transverse lines only are apparent, and are different in direction from the others. There are two parallel areas at the outer or dorsal margin, the inner one being longitudinally and the outer one obliquely striated. See Fig. 3. It is proper to state that this figure is taken from the Massachusetts species, *A. limosa* according to Haldeman.

Fig. 3.

The rostrum is very short, but normally placed in advance of the foot in consequence of the anterior position of the head; it is broader than long, and emarginated at the middle of its antero-inferior edge. The tentacles are slender, very long, two-thirds as long as the foot, exactly cylindrical, and blunt or truncated at their tips. The eyes are placed just at the outer bases of the tentacles, on the *anterior* side of somewhat prominent tubercles or bulgings of this part of the head. The mantle edge is simple. The gill, a portion of which is represented in Fig. 4, is situated in the usual position on the inner surface of the mantle, and is rather broad, far broader than in the Viviparidæ and Melaniidæ, and consists of transverse laminæ of a somewhat triangular form with the prominent apices bent over to the left.[1]

Fig. 4.

[1] Mr. Haldeman, in his "Monograph of Amnicola," page 6, attributes to the genus "about 8 rows of pectinated branchiæ." I am unable to comprehend what is referred to here; perhaps the branchial laminæ themselves

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The generative organ of the male (Fig. 5) is of moderate size, and situated on the right side of the back, a short distance behind the right tentacle. It consists of a subglobular base from which arise two forks or processes, one of which is short, straight and flattened, with parallel sides and truncated extremity; while the other is longer, pointed, and coiled loosely around the first, scarcely however completing a single turn. The generative orifice in the female is in the usual position at the juncture of the body with the mantle, a short distance within the margin of the latter.

Fig. 5.

The apparatus for taking food is as follows: At the inferior end of the proboscis we find the mouth, with its jaws, which are strong, and of the usual imbricated structure, resembling much those of *Rissoa*, as figured by Troschel, except that the marginal denticles are less pointed. The teeth of the lingual ribbon (Fig. 6) are arranged in seven rows, 3 . 1 . 3. The rhachidian tooth is

Fig. 6.

very broad, at least three times as broad as long. It has a tongue-shaped process arising at the centre of its concave anterior surface, and projecting downward, reaching beyond the base. Its lateral lobes are acutely triangular and somewhat curved, and each of them presents, upon the anterior surface, a row of four denticles, extending from near the cusp to the lateral extremity, of which four denticles the two middle ones are minute, and the

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are meant, but these are not pectinated. These branchiæ are undoubtedly in a single row.

In speaking of the gill, the larger or principal one is always referred to in the present paper, the other being minute and inconspicuous, and rarely mentioned in descriptions.

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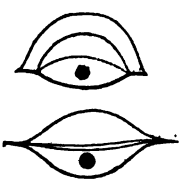
two outer ones large. The upper margin of the rhachidian tooth is concave, and its broad cusp[1] is 7-denticulated—the central denticle being large (larger than is represented in the cut), though but little projecting, while the three lateral ones on each side are small and equal. The intermediate tooth ("zwischenplatte") is very considerably produced and narrowed below, so that its body is very small and its peduncle long, and the body has a strongly projecting knob at its infero-interior angle. Its cusp is armed with five strong, sub-equal denticles—the inner one being rounded and blunt, while all the rest are acutely triangular and strongly projecting. There seems to be also a minute denticle on the inner side of the large inner denticle. The two lateral teeth are long, slender, and curved; the terminal margin of the pointed inner one being armed with about eighteen minute denticles, and the rounded extremity of the outer one being so minutely serrated that the denticles, thirty or forty in number, can only be perceived under very high powers of the microscope

Of the *Amnicola porata* the males and females occur in about equal numbers. The ova are deposited, in this latitude, during the months of April and May. The ova-capsule (Fig. 7) is thin, corneous, of a semi-lenticular shape, and attached by the cut face of the lens, which forms the base. The free limb is margined with a broad thin lamina of the same delicate horny texture as the envelope of the capsule itself. In size, these ova-capsules are a little larger than the head of the animal. They are deposited singly, and each contains but a single egg, which floats freely about in the fluid surrounding it. Those which occurred to me were found sticking to the shell of a female, although they were probably not deposited by the same individual, but by some other, while they were huddled together in groups according to their practice at this season.

Fig. 7.



It will be noticed that this description of the ova-capsule does

[1] It must be remarked that in the view of the teeth which is usually presented under the microscope, and which is represented in every diagram of a single row, the denticles of the cusps of the teeth appear foreshortened, and thus much shorter and blunter than they really are.

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not agree with that given by Mr. Haldeman, in his Monograph,[1] except in regard to the isolation of the egg. This author states that the ova are deposited "in small oblong detached glairy masses, each of which contains apparently but one germ. The color of the germ is orange, of the mass yellowish transparent, with a dark central line upon the surface from end to end." If it were true that the eggs occur in "glairy masses" they would approximate in character to those of the fresh-water Pulmonates. In view, therefore, of the discrepancy between my own observations and those of Mr. Haldeman on this point, it will be proper to state that I have not actually witnessed the deposition of the egg by the mother. I have, nevertheless, no doubt whatever that the eggs which I have described above are really those of *Amnicola porata*. As far as has yet been observed, the eggs of all the allied Ctenobranchiates are contained in ova-capsules when deposited, and it would be very remarkable if those of the *Amnicola* formed the only exception. The "dark central line" mentioned by Haldeman probably corresponds to the lamina of the ova-capsule, described above.

The true Amnicolæ are exclusively aquatic, living in the deeper fresh-water lakes, and streams which do not dry up in summer. They creep with a regular gliding motion, the right and left sides of the sole of the foot being alternately put forward, as is usual in the creeping rostrifers

Not having had an opportunity of examining all of the species which have been referred to *Amnicola*, I cannot, of course, say with certainty how many and what species truly belong to the restricted genus. There is a shining horn-colored shell found in Vermont and New York—which is probably the *A pallida* of Haldeman, although I have seen it labelled both *A. lustrica* and *A. grana*—the pupoid form of which, in connection with the shape of the aperture, has led me to suppose it generically distinct. I have, however, recently examined the lingual dentition of this species, and find it to be nearly like that of *Amnicola porata*, the rhachidian tooth being exactly similar. The species probably belonging here are, besides Say's *Paludina porata* and *P. limosa*, his *P. grana;* the *Amnicola orbiculata* and *A parva* of Lea; the *A. decisa*, *A. galbana*, and *A. pallida* of Haldeman, and the

[1] Monograph of the genus Amnicola, p. 4.

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Paludina cincinnatiensis of Anthony. The *Paludina lustrica* of Say, may perhaps belong to Gill's genus *Lyogyrus*, one of the Valvatidæ, on account of its large umbilicus and labrum simply touching the penult whorl—characters which recall the young of *Valvata pupoidea*, Gould.

It may here be remarked that none of the so-called "Amnicolæ," the dentition of which is figured by Troschel, in his "Gebiss der Schnecken," Vol. I, pl. viii, belong to the genus as here restricted to forms congeneric with the type, *A. limosa*, Hald.

Genus **BYTHINELLA**, Moq.-Tand.

Moquin-Tandon, in his work on the Terrestrial and Fluviatile Mollusks of France, published in 1856, considered all the fresh-water Rissoids of that country as belonging to a single genus, *Bythinia*, which he divided into two subgenera: *Elona*, synonymous with the true *Bythinia* of Gray, and *Bythinella*, Moq.-Tand., comprehending numerous small snails belonging to our subfamily Hydrobiinæ. The preoccupied name *Leachia* had already been applied to these latter forms by Risso. The group *Bythinella*, as proposed by Moquin-Tandon, contains at least two distinct genera, neither of which is synonymous with our *Amnicola;* but the name must be retained for the forms congeneric with *B. viridis*, the type of the genus as originally indicated by that author in the "Journal de Conchyliologie," II (1851), p. 239, note. I have not been able to procure specimens of these European true Bythinellæ for examination in regard to their lingual dentition; but Troschel, in his work already frequently quoted, has figured the teeth of a species called by him "*Amnicola* (*Subulina*) *thermalis*,"[1] which is probably congeneric with the true Bythinellæ, the *Turbo thermalis* of Linnæus being a fresh-water species.[2] In this species Troschel describes the rhachidian tooth as having but one basal denticle on each side, and a 9-denticulated cusp; the intermediate tooth with a peduncle longer than the body, and a 6-denticulated cusp; the inner lateral tooth armed at the summit with eighteen teeth, and the outer one with the margin of the summit smooth; the character of this latter

[1] Gebiss der Schnecken, I, 108, viii, 6.

[2] "Habitat prope thermas pisanas in aquis dulcibus." Linn., Syst. Nat., ed. 12, No. 1237.

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tooth being peculiar, as in all other genera of the Hydrobiinæ it is denticulated. This we will consider, for the present, as the dentition of the genus *Bythinella*.

The shells of the Bythinellæ differ from those of the Amnicolæ in being much more elongated; they correspond to those of the group *Pomatiopsis*, as proposed by Tryon, although that name must now have a far different signification on account of the character of its type. The apex of the shell is generally obtuse; the whirls are tightly coiled, and the umbilicus generally closed. The tentacles of the animal, according to Moquin-Tandon, are setaceous and pointed (not obtuse at the extremity, as in *Amnicola*); the verge is bifid, but the longer branch is not coiled about the shorter one; the foot is narrow, with its posterior extremity "concealed in great part by the operculum;"[1] and the eggs are "globular, hyaline, sometimes arranged symmetrically in two rows, and forming a band fixed to solid bodies."[2]

By comparison of these characters with those of *Amnicola* given above, it will be seen that *Bythinella* differs from that genus sufficiently both in its shell and its soft parts; in its dentition, and perhaps also in the form of the ova-capsules; and it therefore should not be united to *Amnicola*, as proposed by Troschel, Gill, and others.

The name *Hydrobia* is used for the Bythinellæ by Bourguignat[3] and some other recent writers, but it would seem preferable to restrict that name to the marine forms, as has been done by Frauenfeld.[4] The latter author has, however, wrongly used for the Bythinellæ[5] the name *Paludinella*, Pfeiffer, which was founded[6] on the *Truncatella littorina* of Philippi,[7] an air-breathing snail having the eyes on the upper sides of the bases of the tentacles, and belonging therefore to a group of gasteropods far different from those here treated of.

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[1] Moquin-Tandon, *l. c.*, p. 517.

[2] Moquin-Tandon, *l. c.*, p. 514. Possibly this description of the eggs refers to the true Bythiniæ only.

[3] Guerin's Rev. et Mag. de Zool., XIV, 1862, 96.

[4] Verhandl. der K.-k. Zool.-bot. Gesellschaft in Wien, XIII (1863), 1017.

[5] Loc. cit., XIII, 1863, 199.

[6] Archiv für Naturgeschichte, I, 1841, 227.

[7] Arch. für Naturg., I, 1841, pl. v, fig. 7. See also, on this point, Forbes & Hanley, Brit. Moll., III, 133.

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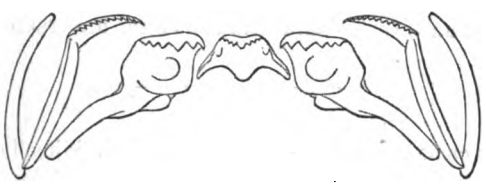
Among Frauenfeld's synonyms we find the name of *Microna*, Ziegler, MSS., which is also equivalent to *Bythinella*.

We have among our North American Hydrobiinæ, species which should, with little doubt, be referred to the genus *Bythinella*. I have not, indeed, had opportunities of studying the entire soft parts of any of these species, nor of ascertaining the form of their eggs—having, except in one instance, to rely upon the shell alone for indications of the generic affinity. That instance is the *Amnicola Nickliniana* (Lea), Haldeman, an elongated species (Fig. 8), of which I have found in the Smithsonian collection specimens containing the dried animal, and have thus been enabled to study the lingual dentition. This (Fig. 9[1]) I find to be nearly of the same type with Troschel's *Amnicola* (*Subulina*) *thermalis*,

Fig. 8.

Fig. 9.



the rhachidian tooth having but one distinct basal tooth on each side, though an obtuse lateral lobe is developed below it, and a 7-denticulated cusp; the intermediate tooth has the inferior process or peduncle longer than the body (which has a central cavity and an infero-interior projection not seen in Troschel's figure of the dentition of *thermalis*), and a 6-denticulated cusp; the inner lateral has the outer margin of the shank reflexed or thickened, and has a 12-denticulated cusp; and the summit of the outer lateral is apparently smooth, although it has once appeared to me serrated, under a very high power; if so, the denticles must be exceedingly minute and numerous.

In view of the shape and obtuse apex of the shell, and the character of the dentition, I do not hesitate to place the *Palu-*

[1] It should be remarked that in this figure, as in most other figures of lingual dentition in this paper, the teeth are represented thrown a little out of their natural positions in respect to each other in order to show more distinctly the form of each.

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dina Nicklíniana of Lea in the genus *Bythinella*. The other American species, probably referable to the same genus, are *Amnicola attenuata*, Haldeman, *A. tenuipes*, Couper, *A. obtusa* (Lea), Haldeman, and *Pomatiopsis Binneyi*, Tryon.

The Bythinellæ cannot be distinguished by the shell alone from the brackish-water Littorinellæ, and from several of the marine Rissoæ. These two groups are as yet but little known, many of their most important characters remaining to be discovered. From our present knowledge we can only state that the fresh-water genus differs from the Rissoæ in the position of the basal denticles of the rhachidian tooth of the lingual ribbon, and from the Littorinellæ in the obsolescence of the armature of the outer lateral tooth, and in the bifid verge. The verge in *Littorinella minuta* (*Cingula minuta*, Gould), the only species I have examined, is simple and not forked. Practically, of course, the difference in the element they inhabit enables us to distinguish these groups, and may serve the purpose until their characters are better understood.

We now come to a group of American Hydrobiinæ in which the shell is globular in shape, and of large size, much larger, in fact, than in any other Rissoids, and approached only, in this respect, by the Bythiniæ and Potamopyrgi. The *Amnicola isogona*, Lea, *A. integra*, Hald., *A. altilis* (Lea), and *A. Nuttalliana*, Cooper, may be mentioned as examples. They were originally described as Melaniæ or Paludinæ, but have, for the most part, been since placed in *Amnicola*, although some authors have been inclined to place them in the Melanian genus *Leptoxis*, to which they have considerable resemblance, both in shell and operculum; or in *Bythinia*, from which they differ much in both these hard parts. The question of their true position is now solved by an examination of their soft parts; they are undoubtedly Hydrobiinæ. I have had opportunities of studying several species of the group, and find among them three distinct genera, founded on the character of the verge and shell, which will be described below. One of these, *Somatogyrus*, has already been indicated by Mr. Gill, upon the characters of the shell in the *Amnicola depressa* of Tryon. The genus *Lithoglyphus* of Mullfeldt, found in Europe and South America, belongs to the same group. The "*Amnicola*

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isogona" and "*A. integra*" have in fact been placed in this genus by Frauenfeld.[1]

Genus **SOMATOGYRUS**, Gill.[2]

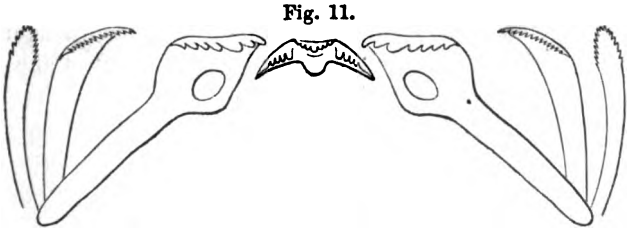
I am indebted to the kindness of Mr. Tryon, and of Professor Sheldon, of Davenport, Iowa, for alcoholic specimens of *S. depressus* (Fig. 10), the species upon which this genus was founded. Very singularly, however, among these specimens, more than a hundred in number, I can find no males, and am therefore unable to describe the form of the verge in the type.

Fig. 10.

The genus presents the following characters: Shell short, thin, simply striate, distinctly umbilicated, and with four to six whorls; the body-whorl subglobose, more or less shouldered above; the spire small, and the suture impressed. Aperture oblique (upper part most advanced), rhombo-ovate, narrowly rounded in front and behind; peritreme thin and acute, appressed behind, below the upper angle, to the whorl, and with its entire margin in the same plane. Operculum subspiral, corneous, but comparatively thick and strong, and with its inner margin regularly convex. Foot short. Snout robust, and considerably longer than in *Amnicola*. Tentacles tapering, pointed.

The lingual dentition of the type is as follows (Fig. 11): Rha-

Fig. 11.



chidian tooth short and very broad, and trilobate below, with the outer angles much produced and narrow; cusp armed with seven denticles; basal denticles four on each side, the innermost largest, but not reaching the inferior margin of the tooth, and

[1] Verhandl. der K.-k. Zool.-bot. Gesellschaft in Wien, XIII, 1863, 194, 195.

[2] Proc. Acad. Nat. Sci. Phila., 1863, p. 34.

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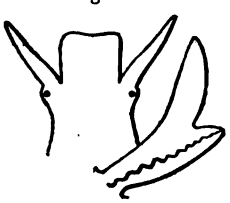
the others gradually decreasing in size outwardly, the outermost being obtuse and rather a lobe than a denticle. Intermediate tooth with the body perforated,[1] and the peduncle more than twice as long as the body; cusp 7-denticulated, the third denticle (counting from within) being twice as broad as the others. Inner lateral tooth with fourteen denticles at the summit. Outer lateral also with fourteen denticles.

Mr. A. O. Currier, of Grand Rapids, Mich., has obligingly sent me, from that locality, alcoholic specimens of the *Melania isogona* of Say (Fig. 12), placed in *Amnicola* by Dr. Lea, which may prove to be congeneric with *Somatogyrus depressus*. Among these specimens there were fortunately some male individuals, so that the character of the verge could be determined. This organ (Fig. 13) is here much compressed, and bifid, the inner branch being much longer than the outer, but no longer than the basal part; while the outer is short, somewhat triangular and pointed, and contains the canal, which is conspicuous from its white color. The rostrum in the same species is rather broad, flat, and square-cut; the tentacles are rather short, in their contracted state scarcely longer than the rostrum, and flattened.

Fig. 12.

Fig. 13.



In the lingual dentition of *S. isogonus*, of which a figure is here given (Fig. 14), with a more enlarged view of the rha-

Fig. 14.

[1] It is very difficult to determine, with the instruments at my command, whether the hole seen in the figure is a true perforation, or only a deep pit. It certainly has the appearance of being the former, though, if so, it is hard to say what its office can be. Nothing like it has yet been described by Troschel or any other author.

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chidian tooth, which is quite different in form from that of *S. depressus*, and noticeable for the great length of the central denticle of the seven-denticulate cusp,[1] the basal denticles are three in number, of which the innermost is by far the largest, and projects beyond the basal margin of the tooth; this basal margin is trilobate, as in *S. depressus*. The intermediate tooth has its peduncle twice as long as the body, and very slender; its body is perforated, and has a strong projection or shelf at the lower margin of the perforation, of nearly similar shape and size with the perforation itself, and appearing, in some points of view, very much like an open door or lid; the cusp is armed with about seven strongly prominent, sharply pointed denticles. The inner lateral tooth has twelve denticles at the summit. The outer lateral has about the same number, much smaller, as usual, than those of the inner.

It will be noticed that this dentition differs in some points from that of the type, *S. depressus;* and is remarkable in the length of the rhachidian cusp, as well as in the peculiar process guarding the perforation of the intermediate tooth. These differences would not, however, seem to be generic, as far as can be judged by our present knowledge of the value of such characters in the Hydrobiinæ.

The shell of *S. isogonus* is similar to that of *S. depressus*. The rostrum and tentacles are also similar to those of the type; they may be seen in Fig. 13. The tentacles, contracted by spirits, are of course much shorter than in life.

Mr. Currier informs me that *S. isogonus* has the habits of *Viviparus*, except that it burrows more deeply into mud. He finds it only on clay bottoms.

The *Melania integra* of Say, and *M. altilis* of Lea, and the *Paludina subglobosa* of Say, are placed in *Somatogyrus* by Tryon.[2] The first two species, however, belong to a different genus, as will be noticed below. The *Paludina subglobosa* I have not seen. It is perhaps the same as *S. isogonus*.

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[1] The figure was drawn from a specimen in which the cusp was broken down by pressure; the lateral margins are in reality continuous.

[2] Proc. Acad. Nat. Sci. Phila., 1864, 104. Mr. T. spells the generic name *Somatogyra*.

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Genus **FLUMINICOLA**, Stm.

In the "Transactions of the American Philosophical Society," Vol. VI, 1839, p. 101, pl. xxiii, fig. 89, Dr. Lea has described and figured a shell (Fig. 15, enlarged) from the Columbia River, Oregon, under the name of *Paludina Nuttalliana*. Subsequently, in a "Report on the Survey of the Northern Pacific Railroad Route," Mr. William Cooper placed this species in *Amnicola*, having probably observed that its operculum is subspiral, and not concentric as in *Paludina*. Mr. Binney having kindly sent me specimens of this mollusk preserved in spirits, I have examined its characters, which prove it to be distinct from *Amnicola* proper, although Mr. Cooper, in placing it in that genus, has made a much closer approximation to the truth than did its original describer.

Fig. 15.

The shell is larger than in any of the other genera of Hydrobiinæ, and resembles in size and general appearance that of the *Leptoxis*-group of Melanians. It is also so like that of the *Paludina decisa* and its allies, that it is by no means surprising that it should have been referred to their vicinity by the distinguished naturalist who first described it, as the operculum was then unknown. In fact we find it to have the same shape, the same eroded apex and olive periostraca, and the same form of aperture with prominent outer lip and sinuated base, which are characteristic of the Eastern Melanthos (Campelomæ). These characters of the shell and its aperture will serve to distinguish the new genus *Fluminicola*, which has the species under consideration for its type, from all other Hydrobiinæ. The soft parts also furnish good distinctive marks.

The shell (Fig. 15) may be described as follows:—It is rather thick and strong, subglobular or subovate inclining to conic, imperforate, and simply striate. Periostraca thick, greenish-olive. Spire obtuse. Suture scarcely impressed. Aperture ovate, rounded in front, angular behind; columella concave, flattened, and callous, especially near the umbilical region; margin of the peritreme not in the same plane, but sinuated.

Having only alcoholic specimens of the animal for examina-

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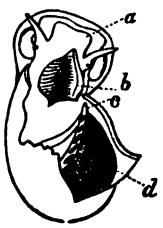
tion, its soft parts (Fig. 16) are described below in their contracted state. The foot, which is folded in the specimen figured, is short, somewhat contracted at the middle, broadly rounded behind, and auricled(?) and bimarginate in front. The operculigerous lobe is simple, little developed, and smaller than the operculum, which latter is thin, horny, subovate, and subspiral, with about three turns. The rostrum (Fig. 16, *a*) is quite large, broad and flattened, somewhat rectangular, bilobate in front, and wrinkled transversely—resembling in its general characters that of the Melaniidæ much more than that of *Amnicola*. The tentacles in their contracted state about equal the rostrum in length; they are somewhat tapering, but flattened, and apparently bluntly pointed at their tips. The eyes are barely perceptible, and are situated on slight protuberances at the outer bases of the tentacles. The branchial cavity (laid open in the figure) is shallow. The mantle edge is simple. The gill (Fig. 16, *d*) is very broad in front, but becomes narrower behind; it consists of about twenty low subtriangular plates, much less projecting than in *Amnicola*, and sharply acuminate at the tip of the projection. The verge (Fig. 16, *b*) is large, flattened, broader than long, and placed obliquely on the right side of the neck, some little distance behind the right tentacle. It has on the left side and posteriorly a great wing-like expansion, the surface of which is striated transversely. This verge, though not bifid as in the preceding genus, is homologous in form, the wing corresponding to the left fork of the organ in *Somatogyrus isogonus*.

Fig. 16.



The oviduct of the female lies on the mantle, parallel to the rectum, filling the space between this latter sack and the line of juncture of the mantle with the body; its orifice is situated a little within the margin of the mantle, immediately below the anus. In the rectum (Fig. 16, *c*) the fæcal matter is broken into fusiform pellets.

The lingual dentition is as follows:—The rhachidian tooth is broad, but longer in proportion than in *Amnicola* and *Somatogyrus*, and trilobate below, the middle lobe being triangular, but not acute; the basal denticles, on the surface beneath the lateral margins, are three in number on each side, rather long and slender,

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acute, and about equal in size; the cusp is armed with five denticles, and the broad central one has apparently an additional very minute one at its base on either side. The intermediate tooth has a moderately broad peduncle, and its cusp is armed with six denticles, of which the third from within is much larger than the others. The lateral teeth are shaped generally as in the allied genera already described; the cusp of the inner one has ten denticles, and that of the outer one six or seven. The outer lateral tooth when reversed or thrown outward, is seen to have a somewhat expanded truncated extremity upon which all the denticles are placed—none appearing on the sides.

It will be observed that this dentition is very distinct from that of *Leptoxis* or any other Melanian genus, the latter never having basal denticles on the rhachidian tooth.

Attached to the shell of some of the specimens before me, I find a thin brownish capsule (Fig. 17), about one-eighth of an inch in diameter, containing eggs, which is in all probability the ova-capsule of the *Fluminicola*. It is disciform, very little convex, and attached by its broadest surface which forms the circular base. It contains about twenty-four ova, and is thus very distinct in character from the ova-capsules of the other genera of Hydrobiinæ, for in all other cases as yet observed, the eggs are deposited singly. The ova-capsules and their various modes of deposition, undoubtedly afford good generic characters.

Fig. 17.

The genus *Fluminicola* seems to be restricted to the freshwaters of the countries bordering on the Pacific coast of North America, all the species yet known being from California and Oregon. The genus will include, besides the type, *F. Nuttalliana*, the following species:—*Paludina virens*, Lea; *P. nuclea*, Lea; *P. seminalis*, Hinds; and *Amnicola Hindsii*, Baird.

Genus GILLIA, Stm.

Fig. 18.

In September, 1863, while on a visit at the residence of my friend Mr. Binney, at Burlington, N. J., I enjoyed opportunities of studying the soft parts of *Melania altilis*[1] of Lea (Fig. 18), which indicate a generic type different from any yet described.

[1] Placed in *Leptoxis* by Haldeman, Monog. Lept., 6, pl. v, fig. 152.

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This genus I take pleasure in dedicating to my esteemed associate Prof. Theodore Gill, in recognition of his great ability as a malacologist, and of the assistance he has rendered me in the determination of the conchological characters of the animals now under consideration.

The shell in this genus is thin or only moderately thickened, simply striate, short, subconic, scarcely umbilicated, and with the body whorl subglobose, the spire rather small, and the suture not impressed. The aperture is ovate, regularly rounded in front, angular behind, with its peritreme thin and acute, appressed behind internally to the whorl, and with its entire margin in the same plane, which is very oblique, sloping downwards and backwards. The operculum is thin, and its margin concave within near the upper end.

The soft parts of *Gillia altilis* resemble those of the preceding two genera in the robust form of the body and snout, but differ considerably in other respects. The foot (Fig. 19, *b*) is oblong, broadly rounded behind, and strongly auricled in front. The tentacles (see in Fig. 19, *a*) are long, slender, and pointed. The eyes are placed on the outer sides of tubercles at the outer bases of the tentacles. The verge (see in Fig. 19, *a*) is very small, simple, compressed, and lunate or sickle-shaped; being thus strikingly different from that of the genera previously described in this paper. The colors of the animal recall those of the Melanians more than those of *Amnicola* proper, being very dark, and minutely mottled, as if peppered in.

Fig. 19.

The lingual dentition (Fig. 20) is of a character in some respects intermediate

Fig. 20.

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between that of *Somatogyrus* and that of *Bythinella*. The rhachidian tooth is of the usual shape, and has on each side but two distinct basal denticles, exterior to which there is a lobe. These denticles are, however, rather large, and acute, extending beyond the basal margin of the tooth. The cusp of the rhachidian tooth is armed with nine acute denticles. The intermediate tooth has its peduncle rather longer than the body, and the body has a depression upon its anterior surface but not a foramen; its cusp has eight denticles. The denticles of the summit in the inner lateral tooth are fourteen in number, and in the outer one ten.

The ova-capsules (Fig. 19, *c* and *d*) are small, nearly hemispherical, attached by the broad base, and are deposited singly, or in groups or linear series. Each contains but a single egg.

The only known species besides the type *G. altilis*, which may probably belong to the genus now under consideration is the *Melania integra* of Say, found in the tributaries of the Mississippi, the shell of which is very similar to that of *G. altilis*. A figure of lingual teeth, said to be of this species, given by Troschel,[1] is here copied (Fig. 21). The only essential difference between

Fig. 21.

this dentition and that of *G. altilis* figured above, is that the rhachidian tooth of the *integra* is represented as having but one basal tooth on each side, but this difference is an important one, and it is desirable that the teeth of both species should be reexamined on this point. The cavity in the body of the intermediate tooth, described above as occurring in *G. altilis*, is slight and may have been overlooked by Troschel in the other species.

It is not improbable that two or more species have been confounded under the name of *Amnicola altilis;* if so, it is only necessary to state that my observations were made upon the form found so abundantly in the Delaware River near Burlington, which must be considered as the type of the genus.

[1] *Op. supra cit.*, I, pl. viii, fig. 4.

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II. ON THE SUBFAMILY POMATIOPSINÆ.

Genus unicum **POMATIOPSIS,** (Tryon) Stm.

In the Proceedings of the Philadelphia Academy of Natural Sciences for September, 1862, page 452, Mr. Tryon proposed to separate from *Amnicola* a group of elongated species, as a subgenus under the name of *Pomatiopsis*, with the following diagnosis:—"Shell elongate, the spire (of about six whorls) much exceeding the length of the aperture. Example, *A. lapidaria*, Say." Following the diagnosis above this name could not be adopted for the terrestrial genus now to be described, for there are elongated species and ovate species in both the terrestrial and aquatic groups of the old genus *Amnicola*. But as Mr. Tryon, in accordance with a correct practice which authors would do well to follow universally, has distinctly mentioned "*A. lapidaria*" as the type of the genus, I do not hesitate to adopt his name.

Prof. Gill, in his paper already alluded to, doubts the validity of the subgenus as *defined* by Mr. Tryon, although he recognizes that the type "may however be quite different, and a representative of the Aciculidæ." But the *Pomatiopsis lapidaria*, as I shall presently show, is, notwithstanding its terrestrial habits, by no means allied to the terrestrial Pneumonopoma to which the Aciculidæ belong according to the observations of Moquin-Tandon. The mollusks of that group have a vascular respiratory cavity or lung, and their tentacles have the power of erection and motion during land-progression; while our *Pomatiopsis* breathes by means of a pectinated gill, and has no power of raising its tentacles in air, though in water they are of course mobile. The structure of its respiratory organ also separates this genus from the Truncatellidæ, which have nearly the same mode of progression. One genus, however, which has been referred to the latter family, approaches *Pomatiopsis* very nearly. I refer to the *Tomichia* of Benson, an East Indian form, the respiratory organs of which have not yet been observed.

Pomatiopsis is one of the very few true Ctenobranchiates which have yet been discovered to breathe air, habitually if not solely. Dr. Lewis, in his paper in the Proceedings of the Boston

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Society of Natural History, above referred to,[1] observes that the *lapidaria* in habits is evidently air-breathing, but that in water they "seemed not to be embarrassed in their movements, though they soon made their way out, apparently preferring to be out of it." According to my own observations they exhibit considerable uneasiness when placed in the water, which caused me some surprise when on dissection I found them to possess a true gill and no trace of a vascular "lung." We have, however, analogous cases among the Crustacea, in such genera as *Cardisoma*, *Uca*, *Gecarcinus*, and *Cœnobita*, which breathe air, although their breathing organs consist of gills, of similar structure with those of the aquatic Crustacea. There is no difficulty in understanding that a gill may perform the function of respiration in air, so long as its surfaces are kept damp. Even bivalve Mollusca may be kept out of water for great lengths of time, provided the surrounding atmosphere be sufficiently humid, and the temperature cool. In this case they can of course breathe only air unmixed with water.

That the *Pomatiopsis* is truly terrestrial in its habits, notwithstanding its preference to the vicinity of water, I can have no doubt. Its peculiar mode of progression is, indeed, adapted for land travel only. I have found it living in company with *Succinea ovalis*, *S. avara*, and *Helix electrina*, in places not liable to desiccation, that is, near the margins of streams or marshes which do not dry up in summer. Its occurrence in such places *only*, is in consequence of the necessity of having some moisture for its breathing organs, it being unable, like the Pulmonates, to prevent evaporation, and the consequent desiccation of those organs, by the formation of an epiphragm closing up the aperture of the shell.[2] The animal may be said to be *amphibious*, but only in the sense that *Succinea* and some other terrestrial Mollusca are so; that is, like them it is capable of living for a long time under

[1] Proc. Bost. Soc. Nat. Hist., VIII, 255.

[2] Since writing the above, I have received a letter from Mr. Tryon in which he informs me that "Mr. Conrad lately captured a number of specimens of *Pom. lapidaria*, and laid them away in a dry place. Upon examining them some time afterward he found the animal so much retracted that the operculum was out of sight, showing that, unlike *Amnicola*, it is provided against dry weather, and can exist out of water or even moisture for some time."

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water. It moves under water with an awkward gliding motion, very different from its active "step" on land.

Without further preface I will proceed to the description of the soft parts of the type of the genus.

Pomatiopsis lapidaria.

The wood-cut, Fig. 22, represents the animal as it appears when placed in water.

Fig. 22.

The foot is a very large muscular organ, the texture of which resembles much more that of the Pulmonates than that of *Amnicola* and other aquatic forms. It is considerably broader than that of *Amnicola*, and capable of being protruded forward somewhat in advance of the rostrum, notwithstanding the considerable length of the latter organ. In progression on land, however, the end of the rostrum is constantly kept in advance. The lateral angles of the anterior extremity of the foot are not sufficiently produced to form auricles. Its posterior extremity is broadly rounded. The lateral surface of the body and foot presents a system of sinuses adapted for the peculiar mode of progression of the animal, which will be described below. These sinuses are most distinctly seen on the left side, to which the following description more particularly applies (see Figs. 25 and 26). First there is a distinct fold separating the foot into an anterior and a posterior part, the latter being about twice as large as the former; which fold, though very conspicuous on the upper surface of the foot, does not distinctly appear on its lower surface, nor form an emargination upon its edge, except when the animal is in motion. This fold terminates above at the point where the foot joins the rostrum. Next, above and nearly at right angles with the first fold, there is a horizontal sinus also arising from the juncture of the foot and rostrum, and separating the foot from the body;—the upper margin of this fold is continuous posteriorly with the operculigerous lobe. Above this there are two oblique folds arising from the inferior base of the rostrum and extending upward and backward, the upper one reaching to the base of the tentacle, and the lower one extending upward along the side of that constriction of the body which is sometimes called the "neck," or pedicle. The position of these

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latter folds will be better understood by an inspection of the wood-cuts, Figs. 25 and 26. It was probably the observation of these sinuses which induced Dr. Lewis, in the papers already referred to, to consider the species as allied to the Melanians. The sinus in the side of the foot in our American Melanians is, however, of a different character and connected with the sexual system.

The rostrum or snout is longer than the tentacles, and capable of great protrusion. It is wrinkled transversely, and its extremity may be expanded so as to form an adherent disk, the upper margin of which is emarginated, while the lower side contains the mouth. The tentacles are short, subulate, pointed, and somewhat thickened near the base. They are not capable of erection in air, but droop, hanging down by the side of the head and resting against the base of the rostrum. The eye is situated on the *outer* side of a rather prominent swelling out or protuberance of the head at the base of the tentacle. On the upper and inner side of these protuberances there is a conspicuous longitudinal fusiform spot of flake-white or yellow, which is a prominent character, probably, however, of specific importance only.

The generative organ of the male (Fig. 23) is situated nearly in the median line of the back, and comparatively very far behind the head, so that it is entirely concealed within the branchial cavity. It is of great size, and when extended would reach to the middle of the rostrum. It is thus twice as long as in *Amnicola*, and moreover is not bifid, but consists of a single broad flattened process, convoluted in a spiral of about one and a half turns, with a pointed extremity, rounded and smooth outer margin, and sharp, wrinkled inner margin.

Fig. 23.

The gill, situated in the position usual in Ctenobranchiates, is rather broader than in the Hydrobiinæ, and the plates, though nearly similar in shape to those of that genus, are much less projecting, and more broadly rounded at the summit. The rectum, lying to the right of the gill, contains fæces formed into little oval pellets; and it may here be mentioned that this character, though seemingly of trivial importance, will distinguish also all of our Hydrobiinæ from the Viviparidæ, in which the fæces appear in a continuous vermiform shape.

In the manducatory apparatus we find jaws resembling those

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of *Amnicola*, though of smaller size. The dentition of the lingual ribbon (Fig. 24) resembles considerably that of *Pomatiopsis*

Fig. 24.

Sayana (*Amnicola Sayana*, Anthony), figured by Troschel in the "Gebiss der Schnecken," tab. viii, fig. 1. The differences are the following:—The central tooth is somewhat broader, and the lateral denticles of its tridenticulate cusp proportionally larger; while the denticles at the base are directed inward. The cusp of the intermediate tooth is 4-denticulate exactly as in *P. Sayana*. But the apices of the two lateral teeth differ considerably from those of that species, being each 5-denticulate, with the denticles subequal.

It will be noticed that, among the several prominent marks of distinction between this dentition and that of the Hydrobiinæ, that the basal denticles of the rhachidian tooth are placed, in *Pomatiopsis*, at or near the base.

The operculum is very nearly like that of *Amnicola*.

To conclude this description I will give an account of the manner in which the stepping mode[1] progression of *Pomatiopsis* is effected. During this motion the foot is so contracted that its two parts are distinct. In what may be called the *first motion*, the anterior part being firmly fixed upon the ground, the posterior part is drawn up to it, by a sliding movement;—in the accompanying cut (Fig. 25)

Fig. 25.

[1] The progression of the *Pomatiopsis* has been called "looping," like that of *Truncatella*. But in *Truncatella* only two points of support are used, while in *Pomatiopsis* there are three. The motion of the latter animal may perhaps with more propriety be called "stepping."

June, 1865.

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it is by exaggeration represented a little raised from the ground, in order better to indicate its movement. At the same moment the snout is thrust forward, and its disk-like extremity affixed to the ground as far ahead as possible. Then comes the *second motion* (Fig. 26); in which, the snout and the posterior part of the foot being firmly affixed and supporting the body, the anterior part of the foot becomes free, and is thrust forward to the disk of the rostrum where it is again planted. The operations of the first motion are then repeated. Thus the animal moves by regular steps, upon three points of support, of which alternately two and one are used. During the movement the lateral folds of the body and foot are seen sliding upon each other, showing how their arrangement contributes to the facility with which this kind of progression is effected.

Fig. 26.

The surface of the animal is constantly lubricated with mucus apparently much greater in amount than is seen in the Helicidæ and other Pulmonates. The foot is capable of adhering with considerable tenacity. While these animals were under my observation, many of them escaped over the edge of the plate in which they were placed, and crept without much difficulty upon its under side.

The females in *Pomatiopsis lapidaria* are considerably more numerous than the males, and are more elongated, having a more cylindrical shell. The outer whorl of the male is proportionally larger in order to afford space for the great verge. The ovary of the female lies further up in the spire, giving the shell its less conical form.

The eggs of *Pomatiopsis* have not yet been observed. Most probably they are deposited in the water.

It will not be out of place here to mention a cercarian parasite with which the *P. lapidaria* was thickly infested at the time of observation (May 6th). When the mollusk is extracted from its shell and placed in water, numbers of little white worms scarcely visible to the naked eye are washed out from the branchial cavity, which prove, on microscopic examination, to be the cercaria-nurses of a species of *Histrionella*. They were filled with young, which were found when extruded to be normally of a tad-pole

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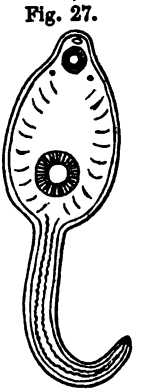
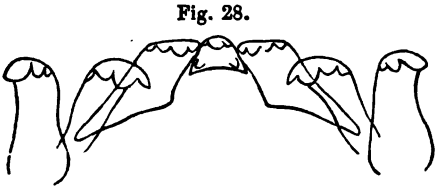
shape, although the body was capable of great elongation and contraction, assuming protean forms. The two black eyes were very conspicuous. There are apparently two acetabula, the anterior one of which is described by Diesing (Systema Helminthum, I, p. 300) as the mouth, and it performs the functions of a sucker. There is a small aperture anterior to it. In creeping, the motion is similar to that of the looping or geometric caterpillars, the suckers being alternately attached. But in water the animal swims by vibrations, and is so rapid in its elongations, contractions, and gyrations, that the eye cannot follow it. Often it takes the form of a round disk, from which the tail projects upward wriggling in the most comical manner. A figure of this little animal, which may be called *Histrionella pomatiopsidis*, is subjoined (Fig. 27). The species already known are European, and found upon aquatic snails, such as *Planorbis* and *Viviparus*.

Fig. 27.



Besides the *lapidaria*, there are undoubtedly one or more others of the so-called Amnicolæ of North America which belong to this genus as I have defined it; but with one exception I cannot state with any degree of probability what they are, having seen the animal of *lapidaria* only. The *Amnicola Sayana* of Anthony, however, upon which Mr. Gill founded his proposed genus *Chilocyclus*, belongs with little doubt to *Pomatiopsis*; for the shells are similar in all essential characters, such as the reflected lip,[1] which is developed only in the adult; the animal has similar terrestrial habits, and its lingual dentition is of the same general type, as may be understood by a comparison of the accompanying wood-

Fig. 28.



[1] This is the character ("circular lip reflected"), which was considered by Mr. Gill as the distinctive mark of *Chilocyclus*.

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cut (Fig. 28) of that of *Sayana*, copied from Troschel's work, with that of the *lapidaria* as given above. The difference in the denticulation of the lateral teeth is indeed considerable, but can scarcely be considered generic, in the absence of other important distinctive characters.

Before concluding our remarks upon this subfamily, we must not fail to allude to the very close resemblance to *Pomatiopsis* shown in the genus *Tomichia* of Benson, which is placed by most writers among the air-breathing snails, of the order Operculata, suborder Opisophthalma, and family Truncatellidæ. In this animal the shell is extremely similar to that of *Pomatiopsis*, and the foot is also provided with lateral sinuses. It is said to live in fresh-water ditches. "The adult specimens, for the most part, crept about on the moist earth at the edge of the water; but the younger individuals were immersed."[1] Such habits would seem to indicate a branchiferous rather than a pulmoniferous mode of respiration, in the young at least. But the eyes are said to be placed on tubercles near the upper bases of the tentacles, whereas in *Pomatiopsis* they are at the outer bases. The superior position of the eyes may be of itself of little importance; but it is found, in other cases to be co-existent with respiratory organs formed for breathing air. The lingual dentition, as figured by Troschel,[2] is similar to that of *Pomatiopsis* in all respects except that the rhachidian tooth has its basal denticles connected by a transverse plate;—a character which approximates it to the Truncatellidæ. Troschel places *Tomichia* in the same group with *Lithoglyphus*, upon what grounds it is not easy to comprehend.

Whatever conclusions may be arrived at from these facts, we have undoubtedly here, between *Tomichia* and *Pomatiopsis*, the closest point of osculation between the branchiferous and pulmoniferous Gasteropods.

Three genera have been recently described in the "Annals and Magazine of Natural History," which have considerable resemblance in form or habits, or in both, to the Pomatiopsinæ. These are *Cecina*,[3] A. Adams; *Blanfordia*,[4] A. Adams, and *Cremno-*

[1] Benson, Ann. and Mag. Nat. Hist. [3], XII, (1863,) 424.
[2] Gebiss der Schnecken, I, pl. vii, fig. 15.
[3] Ann. and Mag. Nat. Hist. [3], VIII, (1861,) 308.
[4] *Ann. cit.* [3], XII, (1863,) 424, pl. vii, fig. 11, 12.

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bates,[1] Blanford. Unfortunately the lingual dentition of these genera, which would afford us the best guide to their true position in the system, has not yet been examined. They are all more or less amphibious in habits, but their respiratory organs have not been studied with sufficient care to determine whether they are branchiferous or pulmoniferous. If they breathe by means of "lungs,"[2] two of them must be referred, with *Tomichia*, etc., to the neighborhood of the Truncatellidæ, while the other will form a new family. But if they are truly branchiferous, they must be closely related to the two subfamilies of Rissoids which have been treated of above.

Cecina and *Blanfordia* are both Mantchurian or Japanese genera, found, like the Truncatellæ, in damp places near the sea. They have both, however, shells with olivaceous periostraca and opercula similar to those of *Pomatiopsis*. In the first-mentioned genus the eyes are also placed at the outer bases of the tentacles, which would seem to exclude it from the Truncatellidæ and approximate it still more to *Pomatiopsis;* but the tentacles are said to be lobiform and flattened, and no mention is made of sinuses in the sides of the foot. Further investigation of this genus is therefore necessary before its true place can be determined.

Blanfordia shows even greater resemblance to *Pomatiopsis* than *Cecina* does, for we find in it the same arrangement of lobes and sinuses in the sides of the foot, indicating the same stepping mode of progression; but this is accompanied by the Truncatelloid character of having the eyes on the *upper* bases of the tentacles; so that the genus will very probably be found to belong to the Truncatellidæ when its respiratory organs and dentition are examined.

Cremnobates is an East Indian genus, found on rocks wet by fresh-water. It is referred by Blanford to the Littorinidæ. It has a trochiform shell very different from that of *Cecina* and *Blanfordia*, and approaching that of the marine genus *Fossarus*. There is said to be a "large vascular sac at the back of the neck." The eyes are on the outer bases of the tentacles, and the foot is not lobed. The operculum is subspiral and testaceous. The

[1] *Ann. cit.* [3], XII, (1863,) 184, pl. iv, fig. 1–12.

[2] The intermediate type of breathing-organ found in the operculated terrestrial Gasteropods, *Cyclostoma*, etc., is here meant.

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position of this genus still remains in doubt, although, notwithstanding the "vascular sac" and its amphibious habits, it seems to me most probable that it will prove to be branchiferous. For, as Mr. Blanford has pointed out, its characters exclude it from all known families of pulmoniferous gasteropods.

[Since the above remarks were written, I have received, through the kindness of Mr. W. H. Dall, a specimen of *Cremnobates synhydrænsis*, which, fortunately, contained the dried animal. I find that its dentition is entirely that of the Littorinidæ.]

III. SYSTEMATIC DIAGNOSES OF THE GENERA OF HYDROBIINÆ.

The subfamily Pomatiopsinæ, as far as is certainly known, contains but one genus, so that its further illustration is at present unnecessary. With the Hydrobiinæ it is far otherwise, no less than fourteen genera being indicated by the considerable differences to be observed among the species of this subfamily, which are very numerous in all parts of the world. In the recent monographs of von Frauenfeld,[1] one hundred and twenty-five species are enumerated, a few of which, however, belong to the allied subfamilies Rissoinæ and Pomatiopsinæ. But the German naturalist has naturally overlooked some described species on account of their having been placed in wrong genera; and there are numerous undescribed species in the collections of American conchologists, particularly in that of Mr. Tryon, which would make the total number of species nearly two hundred.

The generic place of very many of these species, known as yet by the shell only, must remain undetermined until the soft parts and the lingual dentition are examined. Certain genera, as *Stenothyra*, *Tricula*, *Pyrgula*, and *Tryonia*, are indeed easily recognized by the shell alone; but no characters are found in it which will enable us to distinguish certain Littorinellæ and Hydrobiæ

[1] See Verhandl. der k.-k. zoöl.-bot. Gesellschaft in Wien, XII, (1862,) pp. 1158–1160, and XIII, (1863,) pp. 193-210; 1017-1032. This author distributes the species of the subfamily among five genera,—*Nematura*, *Lithoglyphus*, *Paludinella*, *Hydrobia*, and *Amnicola*, but he gives no characters for the distinction of the last three genera, and confesses the difficulty of doing so until the soft parts are better known.

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from *Bythinella* and *Paludestrina*, and the same difficulty will probably be found with *Gillia* and *Somatogyrus*, or with *Lithoglyphus* and *Fluminicola*. I shall therefore under each genus give as examples only a few species which certainly belong to it, without attempting to assign a place to every known species of the family. It would not, of course, be difficult to do this approximately, but rather than run the risk of adding to an already overburdened synonymy, I will leave the work to those who have proper opportunities for observing the entire animal in each case; and would beg my fellow-workers in this field to take the same course.

Subfamily HYDROBIINÆ.

Shell very small, or of moderate size, never exceeding two-fifths of an inch in length, globose, ovate, or elongated, generally umbilicated or rimate, and covered with a periostraca for the most part of an olive color; whorls moderately numerous (4–8), smooth, or, rarely, ribbed or carinated, never cancellated; aperture more or less ovate or rounded, rarely subacute or effuse anteriorly; peritreme continuous; outer lip usually simple and acute. Operculum subspiral, corneous or testaceous. Tentacles, verge, and gills as in the diagnosis of the family, p. 3. Foot without lateral sinuses, truncate and auricled in front, and generally rounded behind; operculigerous lobe destitute of cirri. On the lingual ribbon the rhachidian tooth is much broader at the base than at the summit, with the basal margin trilobate, and the basal denticles situated on the anterior surface, between the base and the oblique lateral margins, being connected with these margins by a carina or lobe usually extending to the infero-exterior angle of the tooth; so that they are rather dependencies of the lateral margins than of the base. The peduncle of the intermediate tooth is slender and generally long. The lateral teeth are straight or regularly curved, with no approach to the sigmoid form seen in the Rissoinæ and Skeneinæ.

Station, in fresh or brackish water.

Like all of the Rissoidæ these little animals are strictly herbivorous. Moquin-Tandon remarks[1] that they have, connected with the stomach, a cartilaginous stylet like that occurring in certain

[1] Hist. Nat. des Moll. ter. et fluv. de France, II, 514.

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bivalves. Something like this stylet I have observed also in our American Melanians.

In the following diagnoses of the genera, the characters given are always those of the type, except when they are expressly stated to have been made out from some other species. In the description of the lingual dentition of the typical or a congeneric species, the formula of the denticles is, strictly speaking, only specific, and is given only as an *indication* of the generic numerical character of these denticles. Their respective limits as to number in each genus must be determined by the examination of the other species.

STENOTHYRA, Benson.

Nematura, Benson, in the Calcutta Journal of Science. Name pre-occupied in Ornithology.

Stenothyra, Benson, in H. & A. Adams' Genera of Recent Mollusca, II, (1858,) 626.

Shell ovate, smooth, imperforate; aperture rounded, contracted. Operculum testaceous.

Lingual ribbon, according to Troschel's figure,[1] with the rhachidian tooth only one-third broader than long, and deeply emarginated on either side beneath the cusp, which is armed with nine denticles; basal denticles two in number on each lateral margin, pointing upward. Intermediate tooth with seven denticles; inner lateral with thirteen; outer lateral with eleven. These denticles may be conveniently formulated thus: $\frac{9}{2+2}$ - 7 - 13 - 11.

Station, fresh-water.

Distribution, India and Southeastern Asia, and the neighboring islands.

Type *S. deltæ*, Benson. Syn. *Nematura deltæ*, Benson, Calcutta Jour. Sci.—H. & A. Ad. Gen. Rec. Moll. I, (1854,) 342, xxxvi, 5 (shell and operculum).—Troschel, Geb. der Schnecken, I, (1857,) 104, vii, 11 (lingual dentition). *Hab.* River Ganges.

The species are enumerated in H. & A. Adams' "Genera," II, 626, and by von Frauenfeld in the "Verhandl. der k.-k. zoöl.-bot. Gesellschaft in Wien," XII, (1862,) p. 1158.

This genus is placed in the Viviparidæ by H. & A. Adams, von Frauenfeld, and most other authors, and in the Littorinidæ

[1] Gebiss der Schnecken, I, pl. vii, fig. 11.

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by Gray. Troschel arranges it with *Bythinia;* the two genera forming his group Bythiniæ. But it is removed from the Bythininæ by its subspiral operculum.

TRICULA, Benson.

Tricula, Benson, Calcutta Jour. Sci., III, (1843.)

Shell elongated, smooth, subperforate; aperture ovate, rather narrow; inner lip thickened. Operculum corneous, with the nucleus very small and close to the base. Rostrum elongated. Tentacles filiform.

Lingual dentition unknown.

Station, fresh-water.

Distribution, India.

Type *T. montana*, Benson, *loc. supra cit.*—H. & A. Ad. Gen. Rec. Moll. I, (1854,) 306, xxxii, 5, 5*a*, 5*b* (shell and operculum). *Hab.* River Kaaman, India.

No other species is known. It is placed in the Melaniidæ by Benson and H. & A. Adams. Benson says that the soft parts resemble those of *Melania*, but the characters he gives of these parts do not serve to distinguish them from those of the Hydrobiinæ, to which group the genus has been referred by Brot.[1] My opinion of its affinities is based upon the characters of the shell, such as its small size, continuous peritreme, umbilicus, etc., which do not occur in the Melaniidæ.

LITTORINELLA, Braun.

Littorinella, Braun, Ber. üb. d. Vers. d. Naturf. in Maynz, (1846,) p. 148;—also Thomæ, Jahrb. des Ver. für Naturkunde in Herzogthum Nassau, II, (1845,) 159.

Shell ovate or elongated, thin, smooth, perforate; whorls ventricose; apex obtuse; aperture rather broadly oval; inner lip not thickened. Operculum corneous. In *L. minuta* the rostrum is rather long; the tentacles very slightly tapering, and blunt at the extremity; the verge is simple, slender, tapering, compressed, and pointed; and the foot is rounded behind.

Lingual dentition of *L. minuta:* Rhachidian tooth without a central basal process, and with a small lobe, almost amounting to

[1] Cat. Syst. Melân., (1862).

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a denticle, at the outer side of the single basal denticle. Intermediate tooth with the body quadrate and strongly projecting at its infero-interior angle, which is blunt; peduncle very long. Formula of the denticles: $\frac{7}{1+1}$ - 5 - 12 - 12.

Station, brackish or sea-water in sheltered positions.

Distribution, probably mundane.

TYPE *L. ventrosa.*—*Turbo ventrosus*, MONT.—*Cyclostoma acutum*, DRAP.—*Rissoa ventrosa*, FORBES & HANL., Brit. Moll., III, (1853,) 138, lxxxvii, 1, 5, 6, 7. *Hab.* Europe.

The following species belongs, with little doubt, to the same genus:—

L. minuta.—*Turbo minutus*, TOTTEN.—*Cingula minuta*, GOULD, Inv. Mass. (1841,) 265, fig. 171. New England

The name *Littorinella* was originally proposed by Braun for "the Paludinas with a spiral operculum," which would make it include nearly the entire subfamily; and no species are mentioned by him, from which we can select a type. Thomæ, in the "Jahrbuch," quoted above, was the next author who used the name, and his first species must be taken as the type. This species is the *Cyclostoma acutum* of Draparnaud, a brackish-water or marine species, identical with the *Turbo ventrosus* of Montagu. The characters of the soft parts of this species, including its lingual dentition, are as yet unknown, but the shell so closely resembles that of the common "*Cingula minuta*" of the coast of New England, that we can have little doubt that they are congeneric. The characters of the animal, other than conchological ones, have therefore been drawn from the latter species. These characters seem to forbid its generic association with *Hydrobia* as typified by *H. ulvæ*. But, should the soft parts of Montagu's *Turbo ventrosus* be found, upon examination, to present characters differing generically from those of Totten's *Turbo minutus*, or if they do not so differ should Thomæ's shell be found to be generically distinct from the *Turbo ventrosus*, we would propose for the genus here indicated, the name *Ecrobia*, with *Turbo minutus* as the type. In our efforts to retain the names previously applied without knowledge of the true characters, to members of the group under consideration, and to avoid the introduction of new names which may prove to be synonyms, we experience great difficulty in ascertaining the typical species upon which such genera must be supposed to be founded; and when

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that species is decided with some degree of certainty, materials are not always at hand for the determination of the important characters of its soft parts.

HYDROBIA, Hartmann.

Hydrobia, Hartmann, in Sturm's Fauna Deutschland's, Abth. VI, (1821,) Heft 5, p. 46 (in part).

Paludinella, Lovèn, Öfv. af. k. vet.-Akad. Förh., III, (1846,) 157 (not of Pfeiffer).

Littorinida, Eyd. & Soul., Voy. Bonite., Zool., II, 536.

Shell ovate or elongated, smooth, subperforate; spire conic; whorls flat; apex acute; aperture ovate; inner lip not thickened. Operculum corneous. Rostrum rather long. Tentacles somewhat tapering, but blunt at the extremity. Foot somewhat pointed behind.

Lingual dentition of the type: Rhachidian tooth very broad, with a strong, central, obtuse, tongue-shaped process from the anterior concave surface, directed downward and reaching beyond the base. Intermediate tooth shaped as in *Littorinella minuta*, but with a deep concavity in the body. Lateral teeth with the dorsal or exterior margin of the peduncle or shank reflected or thickened. Formula of the denticles: $\frac{7}{1+1}$ - 6 - 13 - 25.

Station, brackish water.

Distribution, mundane.

Type *H. ulvæ*, H. & A. Ad., Gen. Rec. Moll., I, (1854) 335, xxxv, 10 (animal, shell, and operculum).—*Turbo ulvæ*, Penn.—*Rissoa ulvæ*, Forbes & Hanl., Brit. Moll., III, (1853) 141, lxxxi, 4, 5, 8, 9, and lxxxvii, 2, 8 (shell), and jj, 8 (animal). *Hab.* Europe.

The difficulty of separating the Littorinellæ and Hydrobiæ from the Bythinellæ and Paludestrinæ by the shell alone, has been already alluded to. It might be convenient, as a temporary expedient, to arrange all the brackish-water species in the two former genera, and the fresh-water ones in the other two, the ultimate separation being founded upon the character of the apex of the shell and of its whorls.

My reasons for retaining the name *Hydrobia* for the genus typified by *H. ulvæ*, have been stated on page 6.

The *Paludinella* of Lovèn (not of Pfeif., on which see p. 18)

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is synonymous with *Hydrobia*. H. & A. Adams[1] have rightly understood Pfeiffer's genus, as their description shows, but most of the species they refer to it, among them our *Littorinella minuta*, belong to groups entirely different.

BYTHINELLA, Moq.-Tand.

Leachia, Risso, Hist. Nat. d'Europe Meridionale, IV, (1826) 100, 102 (not of Lesueur, 1821).

Bythinella, Moq.-Tand., Jour. de Conch. II, (1851) p. 239, note; and Hist. Nat. des Moll. ter. et fluv. de France, II, (1855) 515.

Subulina, Troschel, Geb. der Schneck., I, (1857) 108 (not of Beck).

Paludinella, Frauenfeld, Verhandl. der k.-k. zdol.-bot. Gesellschaft in Wien, XIII, (1863) 199 (not of Pfeiffer).

Microna, Ziegler, in Frauenfeld's "Arten der Gattung *Lithoglyphus* Mhlf." etc., *loc. cit.* XIII, (1863) 200.

Shell elongated-ovate, usually somewhat pupiform, imperforate, or simply rimate; apex obtuse. Aperture oval or rounded; peritreme continuous, outer lip slightly thickened. Operculum corneous, with the nucleus moderately large, and not very close to the basal margin. Tentacles tapering, but blunt at tip. Foot rather narrow, rounded behind. Verge (in *B. ferrusina*) bifid.

Lingual dentition of *B. thermalis*, according to Troschel[2]: Rhachidian tooth moderately long, with the infero-lateral angles much produced. Intermediate tooth with the body longer than broad. Formula of the denticles: $\frac{9}{1+1}$ - 6 - 18 - 0.

Station, fresh water.

Distribution, Europe and North America

Type *B. viridis*, Moq.-Tand., Journ. de Conch., II, (1851) p. 239, note; and Hist. Nat. des Moll. ter. et fluv. de France, II, (1855) 524, pl. xxxix, fig. 11–17.—*Bulimus viridis*, Poir, Prodr., (1801) 45.—*Cyclostoma viride*, Drap., Hist. Moll., (1805) p. 37. *Hab.* Western Europe.

The following species may also be mentioned:—

B. ferrusina, Moq.-Tand., Hist. Nat. des Moll. ter. et fluv. de France, II, (1855) 516, pl. xxxviii, fig. 20–28.—*Paludina ferrusina*, Des Moul. Western Europe.

B. vitrea, Moq.-Tand., *loc. cit.*, II, (1855) 518, pl. xxxviii, fig. 33–36.—*Cyclostoma vitreum*, Drap. Western Europe.

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[1] Genera of Recent Mollusca, II, 315.

[2] Gebiss der Schnecken, I, 108, pl. viii, fig. 6.

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B. abbreviata, Moq.-Tand., *loc. cit.* II, (1855), 519, pl. xxxviii, fig. 37, 38. —*Paludina abbreviata*, Mich. Western Europe.

B. conoidea, Moq.-Tand., *loc. cit.*, II, (1855) 522, pl. xxxix, fig. 3–5.—*Paludina conoidea*, Reyn. Western Europe.

B. brevis, Moq.-Tand., *loc. cit.*, II, (1855) 523, pl. xxxix, fig. 6–10.—*Cyclostoma breve*, Drap. Western Europe.

B. similis, Moq.-Tand., *loc. cit.*, II, (1855) 526, pl. xxxix, fig. 18, 19.—*Cyclostoma simile*, Drap. Western Europe.

B. Nickliniana, Stm.—*Paludina Nickliniana*, Lea, Tr. Am. Phil. Soc., VI, (1839) 92, pl. xxiii, fig. 109. Pennsylvania.

B. Binneyi, Stm.—*Pomatiopsis Binneyi*, Tryon, Proc. Acad. Nat. Sci. Philad., 1863, p. 148, pl. i, fig. 10. California.

See also on p. 20, *ante*, for others.

This genus differs from *Amnicola* in its lingual dentition, the rhachidian tooth having but one basal denticle. It differs from *Littorinella* in having a bifid verge; and from *Paludestrina* in the shape and obtuse apex of the shell, and in the want of perceptible denticulation on the cusp of the outer lateral tooth of the lingual ribbon.

Moquin-Tandon's varicose Bythinellæ, *B. marginata* and *B. gibba*, are not included in the above list of species, because they present characters in the shell which may indicate important differences in the soft parts. Whether they are true Bythinellæ remains to be determined by future examination.

If the type of Hartmann's genus *Hydrobia* should prove to be a fresh-water species, that name will have to be adopted in place of *Bythinella* for this genus.

The name *Leachia*, of Risso, must be rejected on account of its previous use by Lesueur for a genus of Cephalopoda. Lesueur's name is considered synonymous with *Loligopsis* by Gray,[1] but the group seems to be sufficiently distinct from the typical Loligopsides in the tuberculation of the body.

For further remarks upon the genus *Bythinella*, see *ante*, p. 17.

PALUDESTRINA, D'Orb.

Paludestrina, D'Orbigny, in Sagra's Cuba, Moll., II, (1841) 8.

Shell conic, more or less elongated, smooth, imperforate or nearly so; apex acute. Aperture ovate; peritreme continuous; outer lip acute; inner lip not thickened. Operculum corneous.

[1] Cat. Moll. Brit. Mus., Ceph. Antep., p. 39.

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Lingual dentition of *P. culminea*, according to Troschel[1]: Rhachidian tooth very short and broad; basal denticle with a lobe or ridge connecting it with the lateral margin. Body of the intermediate tooth longer than broad, and longer than its peduncle. Formula of the denticles: $\frac{9}{1+1}$ - 9 - 19 - 25.

Station, fresh water.

Distribution, South America and the West Indies.

TYPE *P. Auberiana*, D'ORBIGNY, in Sagra's Cuba, Moll., II, (1841) 8, pl. x, fig. 6, 7. *Hab.* West Indies.

The following are congeneric:—

P. culminea, D'ORB., Voy. Am. Merid., Moll., p. 386, pl. xlvii, fig. 10–12. Bolivia.

P. Cumingiana, D'ORB., Voy. Am. Merid., Moll., p. 385, pl. xlvii, fig. 14–16. Chile.

P. Parchappii, D'ORB., Voy. Am. Merid., Moll., p. 383, pl. xlviii, fig. 4–6. Buenos Ayres.

D'Orbigny's description of his genus *Paludestrina* would make it include the entire subfamily Hydrobiinæ, with the exception of *Stenothyra*, and this was doubtless intended by him, as he seems to have been ignorant of the generic names previously proposed for the shells of the group. As in all such cases, we must select a type from among the species described by him, and of these we select the first, not only on account of the accordance of such a selection with a rule of nomenclature generally adopted, but because it will afford us a name for a group of American forms which should be generically separated from the other elongated fresh-water species which we have included in *Bythinella*.

The first species ever described by D'Orbigny, as far as we have been able to ascertain, is the *P. Auberiana* of the "Mollusques" of Sagra's Cuba. This species is said by the author to be "common on the maritime sands of Cuba," which at once suggests the idea that it may be a *Hydrobia* or *Rissoa*, and not congeneric with the South American fresh-water forms we have included in the genus, from one of which the lingual dentition of the genus has been made out. But we find that Poey, an excellent observer, has placed the *P. Auberiana* among the *fresh-water*

[1] Gebiss der Schnecken, I, 108, pl. viii, fig. 5.

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shells of Cuba,[1] and D'Orbigny himself says that the species was found at Guadeloupe, "at the mouth of a rivulet." The conclusion would naturally follow that D'Orbigny was misinformed with regard to its habitat, and that it is not a marine, but a fresh-water species. I adopt this conclusion the more willingly on account of the close agreement of the shell of *P. Auberiana* with the South American fresh-water *P. culminea;* both having a form rarely found among the shells of the marine Hydrobiæ. If, however, I should prove to be mistaken in this conclusion, *Paludestrina Auberiana* will doubtless be found to be a *Hydrobia*, of which D'Orbigny's name will then become a synonym. In this case I would propose the name *Heleobia*, for *P. culminea* and its allies.

PYRGULA, Christofori & Jan.

Pyrgula, Christofori & Jan, Consp. Meth. Moll. (1832); and Mant. Catal. test., (1832) p. 4.

Shell elongated, turreted, imperforate; whorls carinated. Aperture oval, effuse anteriorly; outer lip not thickened. Operculum corneous, with projections on the outer margin, corresponding to the concavities of the carinæ of the shell. In the soft parts of *P. bicarinata*, according to Moquin-Tandon, the foot is "narrow, obtuse, and as if bilobate in front, somewhat pointed behind," and the tentacles are slender.

Lingual dentition unknown.

Station, fresh waters in mountainous regions.

Distribution, Europe and South America.

Type *P. helvetica*, H. & A. Adams, Gen. of Rec. Moll., I, (1854) 309, pl. xxxii, fig. 7.—*Melania helvetica*, Michelin, Mag. de Zool., 1831, p. 37, pl. xxxvii.—*Pyrgula annulata*, Christ. & Jan, Mant. Catal. Test. (1832) p. 4. Of a white color. *Hab.* Switzerland.

The following are all the other species as yet known:—

P. bicarinata, Bourguignat, Rev. et Mag. de Zool., [2] XIII, (1861) 528.—*Bythinia bicarinata*, Dupuy.—*Bythinella bicarinata*, Moq.-Tand., Hist. Nat. des. Moll. ter. et fluv. de France, II, (1855) 520, pl. xxxviii, fig. 39–42. France.

P. pyrenaica, Bourguignat, *loc. cit.*, [2] XIII, (1861) 530. Pyrenees.

P. andicola, Stm.—*Paludestrina andicola*, D'Orb., Voy. Am. Merid., Moll., p. 385, pl. xlvii, fig. 13. Andes of Bolivia.

[1] Mem. sobre la Hist. Nat. de la Isla de Cuba, II, (1856) 10.

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It is interesting to notice that all the species of the genus as yet described are severally reported to occur in mountainous districts; an instance of correlation of form to external conditions.

Herrmansen suggests that the name should be changed to *Pyrgiscus*, as the correct spelling. But *Pyrgula* is not a hybrid term, since *pyrgus* is a Latin as well as a Greek word.

TRYONIA, Stm.

Tryonia, Stimpson, Am. Journ. of Conch., I, (1865), 54.

Shell perforate, elongated, turreted, subulate, acute at summit and rather pointed at base; surface longitudinally ribbed or plicated, not spinous; whorls numerous, shouldered. Aperture small, oblique, rhombo-ovate; and somewhat pointed, sinuated, and effuse at base; outer lip thin and sharp, projecting below; inner lip appressed to the whorl above, peritreme however continuous.

Operculum and lingual dentition unknown.

Station, fresh water.

Distribution, Southern California.

Type *T. clathrata*, Stm. (Fig. 29).—Whorls eight. Longitudinal ribs variable in number, usually about twelve to each whorl. Surface otherwise smooth, or marked with delicate incremental striæ. There is no trace of revolving striæ or lines. Length, 0.2 inch.

Fig. 29.

The specimens described are in a semi-fossilized condition, mostly white, though not chalky, but with an ivory-like hardness. Some of them are translucent, looking as if silicified. From the circumstances under which they were found, however, it is probable that the species existed within a very recent period, if not indeed now living.

Large numbers of specimens were found, in company with other dead fresh-water shells of the genera *Physa*, *Planorbis*, *Amnicola*, *Sphærium*, etc., in the basin of the Colorado Desert, Southern California, by Mr. Wm. P. Blake, on one of the Pacific Railroad Surveys. The basin is the bed of an ancient lake, now dry. The specimens collected by him are in the museum of the Smithsonian Institution.

The genus may be distinguished not only by the form and sculpture of the shell, but by the shape of the aperture and the

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projection of the outer lip, which gives it a character somewhat like that seen in *Campeloma* and *Eburna*.

In company with the Tryoniæ Mr. Blake found a small cancellated shell which has been described as *Melania exigua* by Conrad and as *Amnicola protea* by Gould.[1] In view of the character of the surface, I think it scarcely possible that this species can belong to the Hydrobiinæ. It will, perhaps, be found to be allied to *Bittium*. The occurrence of this marine or brackish-water genus in the Desert would not be surprising, since *Gnathodon* was found in the same basin at a point somewhat nearer the Gulf.

It has, unfortunately, been only possible to describe this genus in a very imperfect manner, the characters of the shell alone being given. I have dedicated it to Mr. Geo. W. Tryon, a well-known conchologist of Philadelphia, to whom we have been indebted for the loan of many interesting specimens of Amnicolæ, etc.

POTAMOPYRGUS,[2] Stm.

Potamopyrgus, Stimpson, Am. Journ. of Conch., I, (1865) 53.

Shell ovate-conic, imperforate; apex acute; whorls coronated with spines; outer whorl nearly two-thirds the length of the shell; aperture ovate; outer lip acute. Operculum corneous. Rostrum of moderate length. Tentacles very long, slender, tapering, and pointed. Eyes on very prominent tubercles. Foot rather short, broadest in front and strongly auriculated.

Lingual dentition of type: Rhachidian tooth trapezoidal; inferior margin nearly straight, faintly trilobate; basal teeth minute and close to the lateral margins. Intermediate tooth with the peduncle very long, three times as long as the body and constricted at its juncture therewith; body subrhomboidal and excavated in the middle; cusp with numerous equal teeth. Lateral teeth constricted near the summit, and with the dorsal or outer margin of the shank reflexed or thickened; outer lateral with a broad summit shaped like a chopping-knife. Formula of the denticles: $\frac{9}{4+4}$ - 11 - 15 - 20.

Station, fresh water.

Distribution, New Zealand.

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[1] Pacific R. R. Reports, Vol. V, p. 332, pl. xi, fig. 6–9.

[2] Ποταμὸς, fluvius; πυργος, turris.

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TYPE *P. corolla*, STM.—*Melania corolla*, GOULD, Proc. Bost. Soc. Nat. Hist., II, (1847) 223.—*Amnicola corolla*, GOULD, U. S. Expl. Exped., Moll., (1852) 129, pl. ix, fig. 149, *a–c*. New Zealand.

No other species is as yet certainly known to belong to this genus. There are other coronated species belonging to the family which must be placed in it, if they are found to agree with it in the lingual dentition, the peculiarities of which consist in the form of the rhachidian tooth, which is not strongly trilobate below as in the other genera of the group, in the approximation of the very small basal denticles of the same tooth to the lateral margins, and in the great number and equal size of the denticles of the intermediate tooth.

The dentition was made out from the type specimen of *Amnicola corolla*, Gould, in which the animal was found uninjured after more than twenty years' desiccation. This specimen is in the museum of the Smithsonian Institution

COCHLIOPA,[1] STM.

Cochliopa, STIMPSON, Am. Journ. of Conch., I, (1865) 52.

Shell depressed-conic; base concave, carinated; umbilicus large and deep; aperture oblique. Operculum thin, corneous, subspiral. Rostrum of moderate size; tentacles rather long, tapering. Verge rather elongated, compressed, geniculated, and bifid, the inner branch being very small, less than one-fourth the size of the outer one and arising at the inner angle of the geniculation.

Lingual dentition of the typical species: Rhachidian tooth short and broad; middle lobe of the basal margin very broad; basal denticles rather large. Intermediate tooth with a long peduncle, and square body having a cavity in the centre. Lateral teeth with an expansion of the inner side of the shank, separated from the summit by a deep rounded sinus; the outer lateral being more expanded than the inner. Formula of the denticles: $\frac{11}{2+2}$ - 8 - 18 - 24.

Station, fresh water.

Distribution, California.

TYPE *C. Rowellii*, STM.—*Amnicola Rowellii*, TRYON, Proc. Acad. Nat. Sci. Phila., 1863, p. 147, pl. i, fig. 8, 9.—Head black; tentacles yellowish, with

[1] Κόχλις, cochlea parva; ὤψ, foramen.

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black tips, and a black ring just beyond the middle. Found in Clear Lake, Cal., by the Rev. Mr. Rowell.

But one species is yet known of this very distinct genus, which differs from all other Hydrobiinæ in its greatly depressed form and large umbilicus. The characters of the soft parts were made out from a specimen of the shell kindly furnished by Mr. Tryon, which fortunately contained a portion of the dried animal.

GILLIA, Stm.

Gillia, Stimpson, Am. Journ. of Conch., I, (1865) 53.

Shell rather large, subglobular, thin, subperforate, smooth; spire small; suture not impressed. Aperture large, broad, ovate, oblique; outer lip thin, acute, not projecting anteriorly. Operculum thin, corneous, regularly ovate. Rostrum rather broad. Tentacles tapering, pointed. Verge small, simple, lunate.

Lingual dentition of the type: Rhachidian tooth moderately long, deeply trilobate below; basal denticles close to the basal margin, and projecting beyond it. Intermediate tooth with the body subrhomboidal, slightly excavated in the middle. Outer lateral tooth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{9}{2+2}$ - 8 - 14 - 10.

Ova-capsules hemispherical, each containing a single egg, and deposited singly or in groups or linear series.

Station, fresh water.

Distribution, the eastern parts of the United States of North America.

Type *G. altilis*, Stm.—*Melania altilis*, Lea, Trans. Am. Phil. Soc., VIII, (1843) 174, pl. v, fig. 23. Pennsylvania to South Carolina.

As mentioned on a previous page, the *Melania integra* of Say, described in the "New Harmony Disseminator," II, (1829) 276, may probably belong to this genus.

SOMATOGYRUS, Gill.

Somatogyrus, Gill, Proc. Acad. Nat. Sci. Phila., 1863, p. 34.

Shell rather large, globular, thin, smooth, perforate; spire small; suture impressed; body whorl globose, more or less shouldered above. Aperture large, oblique, rhombo-ovate, narrowly rounded in front and behind; peritreme thin and acute,

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and with its entire margin uniformly in one plane, the outer lip not projecting anteriorly. Operculum rather thick, corneous, subovate; inner margin concave near the upper extremity. Foot rather short. Rostrum broad. Tentacles tapering, pointed.

Lingual dentition of type: Rhachidian tooth very short and broad. Intermediate tooth with the body perforated. Inner and outer lateral teeth with about the same number of denticles. Formula of the denticles: $\frac{7}{4+4}$ - 7 - 14 - 14.

Station, fresh water.

Distribution, the central parts of North America.

TYPE *S. depressus*, GILL, loc. cit., 1863, p. 34.—*Amnicola depressa*, TRYON, Proc. Acad. Nat. Sci. Phila., 1862, p. 452, wood-cut. Iowa.

As suggested on a previous page, the *Melania isogona* of Say, in the "New Harmony Disseminator," Vol. II, (1829) p. 277, will prove to belong to this genus; if the typical species, *S. depressus*, is found to have a broad, compressed, and bifid verge.

AMNICOLA, GOULD & HALD.

Amnicola, GOULD & HALD., in Gould's Invert. of Mass., (1841) p. 228.

Shell small, rather short, ovate or subglobular, thin, smooth, perforate; spire not acute. Aperture broadly ovate, not oblique; outer lip thin and sharp, not projecting anteriorly. Operculum corneous. Foot rather short and broad, expanded and broadly rounded behind. Rostrum short. Tentacles cylindrical, blunt at their tips. Verge short, bifid, with a globular base.

Lingual dentition of *A. porata:* Rhachidian tooth very short and broad, with a tongue-shaped process from the middle of the anterior surface, reaching beyond the base. Intermediate tooth with a short broad body having a strongly projecting infero-interior angle, and a very long peduncle. Formula of the denticles: $\frac{7}{4+4}$ - 5 - 18 - 30.

Ova-capsules semi-lenticular in form, with a laminiform limb. Each contains but one egg.

Station, fresh water.

Distribution, North America.

TYPE *A. limosa*, HALDEMAN, Monog. Amn., p. 10, pl. i, fig. 5, 6.—*Paludina limosa*, SAY, Journ. Acad. Nat. Sci. Philad., I, 125.—*Amnicola porata*, GOULD, Inv. Mass., (1841) 229, fig. 157. New England States.

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The following species may be added :—

A. decisa, Hald., loc. cit., p. 7, pl. i, fig. 2, 3. Pennsylvania.

A. pallida, Hald., loc. cit., p. 12, pl. i, fig. 7. Lake Champlain.

A. perata, Hald., loc. cit., p. 13, pl. i, fig. 8. Northern United States and Canada.

See also on p. 16, *ante*, for others.

LITHOGLYPHUS, Muhlfeldt.

Lithoglyphus, Muhlfeldt, in Hartmann's Moll. of Sturm's "Fauna Deutschlands," VI, (1821) p. 57.

Lithoglypter, Fitz., Syst. Verz., (1833) p. 116.

Lithoclypus, Villa, Disp. Syst., (1841) p. 36 (fide Hermannsen).

Shell globular, thick, smooth, imperforate; spire short; suture not impressed. Aperture broadly subovate, or nearly circular, nearly as broad as long; inner lip callous; outer lip simple. Operculum corneous, rounded.

Soft parts of *L. lapidum:* Foot large, longer than the shell. Tentacles short, rather tapering and pointed. Verge bifid from the base, forks cylindrical, the posterior being two-thirds as long as the anterior one.

Lingual dentition of *L. fuscus*, according to Troschel:[1] Rhachidian tooth less than twice as broad as long. Body of intermediate tooth longer than broad; peduncle rather short. Outer lateral tooth with fewer denticles than the inner. Formula of the denticles: $\frac{7}{3+3}$ - 7 - 8 - 6.

The only notice we have of the eggs is the following by D'Orbigny with regard to *L. peristomatus*[2]:—"They live in numerous families; each shell carries oval eggs which are affixed to it." We cannot determine from this notice whether the eggs are deposited singly, or in groups covered by a common ova-capsule. Probably the latter arrangement is meant.

Station, fresh water.

Distribution, Southeastern Europe and South America.

Type *L. naticoides*, H. & A. Adams, Gen. Rec. Moll., I, (1854) 321, pl. xxxiv, fig. 1, *a*, *b*, *c*.—*Paludina naticoides*, Ferrusac, Küster, Monog. Paludin., p. 47, pl. ix, fig. 23–26. *Hab.* Moldavia, Dalmatia, etc.

The following species are apparently congeneric:—

L. fuscus, Zgl.—*Paludina fusca*, Küst., Monog. Paludin., p. 46, pl. ix, fig. 19–22. Southern Russia.

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[1] Gebiss der Schnecken, I, 105, pl. vii, fig. 12.

[2] Voy. Am. Merid., Moll., p. 382.

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L. lapidum, H. & A. ADAMS, Gen. Rec. Moll., I, (1854) 321, pl. xxxiv, fig. 1.—*Paludestrina lapidum*, D'ORB., Voy. Am. Merid., Moll., p. 382, pl. xlvii, fig. 10–12. Buenos Ayres.

L. peristomatus, STM.—*Paludestrina peristomata*, D'ORB., loc. cit., p. 382, pl. xlvii, fig. 4–9. Buenos Ayres.

The lingual dentition of the South American species is unknown, and must be ascertained before these species can be said with certainty to belong to the genus *Lithoglyphus*. They resemble the type in the form of the shell

FLUMINICOLA, STM.

Fluminicola, STIMPSON, Am. Journ. of Conch., I, (1865) 52.

Shell comparatively large, obliquely ovate, thick, smooth, imperforate; spire moderate, obtuse. Aperture ovate; inner lip flattened, callous; outer lip effuse and projecting anteriorly, so that the peritreme is not continuously in the same plane. Operculum corneous. Tentacles tapering. Rostrum rather large. Foot broad. Verge large, compressed, with a broad semicircular laminiform expansion or wing on its left side.

Lingual dentition of the type: Rhachidian tooth more than twice as broad as long. Outer lateral tooth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{5}{3+3}$ - 6 - 10 - 7.

Ova-capsules large, circular, depressed, almost discoidal, each containing a large number of eggs.

Station, fresh water.

Distribution, Oregon and California.

TYPE *F. Nuttalliana*, STM.—*Paludina Nuttalliana*, LEA, Tr. Am. Phil. Soc. VI, (1839) 101, pl. xxiii, fig. 89. Oregon.

To which we add the following:-

F. virens, STM.—*Paludina virens*, LEA, loc. cit., VI, (1839) 91. Oregon.

F. nuclea, STM.—*Paludina nuclea*, LEA, loc. cit., VI, (1839) 91. Oregon.

F. seminalis, STM.—*Paludina seminalis*, HINDS, Voy. Sulphur, Moll., p. 54, pl. xvi, fig. 22. California.

F. Hindsii, STM.—*Amnicola Hindsii*, BAIRD.

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SYNOPTIC TABLE OF THE GENERA OF HYDROBIINÆ.

A. Operculum testaceous . . . . . *Stenothyra.*

B. Operculum corneous.

a. Shell elongated; only one distinct basal denticle on either side of rhachidian tooth.

1. Shell smooth.

* Inner lip thickened . . . . . *Tricula.*

** Inner lip not thickened.

† Verge simple.

‖ Apex of shell obtuse; whorls convex; rhachidian tooth without a central basal process . *Littorinella.*

‖ ‖ Apex of shell acute; whorls flattened; rhachidian tooth with a central basal process . *Hydrobia.*

†† Verge bifid.

‖ Apex of shell obtuse; rhachidian tooth moderately long; outer lateral tooth not denticulated *Bythinella.*

‖ ‖ Apex of shell acute; rhachidian tooth very short; outer lateral tooth conspicuously denticulated . . . . . *Paludestrina.*

2. Shell sculptured.

* Shell carinated . . . . . *Pyrgula.*

** Shell longitudinally plicated . . . . . *Tryonia.*

b. Shell short; two to four basal denticles on either side of rhachidian tooth.

1. Shell ovate-conic; whorls coronated with spines; cusp of intermediate tooth with numerous (11) equal denticles . . . . . *Potamopyrgus.*

2. Shell depressed, globular, or ovate; cusp of intermediate tooth with few (5–8) unequal denticles.

* Shell depressed; base carinated; umbilicus large . . . . . *Cochliopa.*

** Shell not depressed; base not carinated; umbilicus small or closed.

† Verge simple; two basal denticles on either side of rhachidian tooth . . . . . *Gillia.*

†† Verge bifid or winged; three or four basal denticles on either side of rhachidian tooth.

‖ Shell thin, perforate; outer lateral tooth with as numerous, or more numerous denticles than the inner.

‡ Shell comparatively large, globose; tentacles tapering; verge very large, compressed *Somatogyrus.*

‡ ‡ Shell small, ovate; tentacles cylindrical; verge small, not compressed . . . *Amnicola.*

‖ ‖ Shell thick, imperforate; outer lateral tooth with fewer denticles than the inner.

‡ Verge bifid, with slender branches . . . . . *Lithoglyphus.*

‡ ‡ Verge winged on one side, not bifid . . . . . *Fluminicola.*

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ADDENDA ET CORRIGENDA.

Since the completion of the printing of this memoir, Mr. Tryon, in his "American Journal of Conchology," Vol. I, p. 220, July, 1865, has proposed a new genus of Hydrobiinæ under the name of *Gabbia*, with the following diagnosis: "Shell like *Amnicola*, Gould and Hald. Operculum paucispiral, calcareous. Station, fresh water." The only species, *G. australis*, Tryon, is new, and figured on pl. xxii, of the volume quoted (fig. 7). It is from New South Wales. I have no opportunity to examine this shell, but must remark that the characters given in the description do not serve to distingnish it from the immature state of *Stenothyra* in which the contraction of the aperture has not yet commenced. The *figure* reminds us of *Bythinia* rather than any other genus, for in it the operculum is represented as decidedly concentric, although said to be "paucispiral" in the description.

On page 12, line 4, after "*Somatogyrus*, Gill," add "*Cochliopa*, Stm."

The figure of *Somatogyrus isogonus*, on page 22, is accidentally defective in representing the lower extremity of the aperture as notched.

August, 1865.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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MONOGRAPH

OF

AMERICAN CORBICULADÆ.

(RECENT AND FOSSIL.)

PREPARED FOR THE SMITHSONIAN INSTITUTION.

BY

TEMPLE PRIME.

WASHINGTON:
SMITHSONIAN INSTITUTION.
DECEMBER, 1865.

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PREFACE.

In the present Monograph of American Corbiculadæ, prepared at the request of the Smithsonian Institution, it is proposed to show the present state of our knowledge of the species, both recent and fossil, which inhabit North and South America. It contains descriptions of all the genera of the family, whether represented on this continent or not, descriptions of the species found in North and South America, notices of their geographical range, references to the collections in which authentic types of many of the species are known to exist, and comparisons of the different species with others of the same genus, indigenous and foreign.

I have been able to identify to my entire satisfaction very nearly all the species described as from America, and the instances in which I have not been successful, are duly noted in the text accompanying the description of the species.

I am aware of the fact that some of the genera adopted in these pages, based chiefly upon characters drawn from the shell alone, ought not to be retained with their present limits; nevertheless our knowledge of the soft parts of the species of this family is still so very imperfect that no other course is open to me but to preserve for the present the genera as I find them, however defective they may actually be.

It will soon be necessary, in order to keep pace with other departments of natural history, to introduce some modifications in the limits of the genera of the *Corbiculadæ*, but no really satisfactory or permanent result will be attained until a careful examination of the soft parts shall have been made.

I am at present engaged upon a new arrangement of the genera of the *Corbiculadæ*, based upon characters drawn from the soft parts and from the shell, and in order to call attention to this

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subject, and to have it examined into by those conversant with it, I give a general outline of some of the changes which I think, in the present state of our knowledge of this family, might be made with advantage.

In the first place I propose to separate the American recent species of the genus *Corbicula* from the species of this genus inhabiting other regions, for the reason that in the American species the palleal impression is terminated in a sinus, whereas in the foreign species it is simple. This is a character derived from the soft parts, though the knowledge of it is conveyed to us by an examination of the shell. The same distinctions exist between the American recent species of the genus *Cyrena* and the foreign species of that genus; it may, therefore, likewise be advisable to constitute a separate genus for the American recent species of *Cyrena*.

In connection with this subject I may mention that three fossil species of *Corbicula* from the Paris basin, which I have had under examination, the *Corbicula cuneiformis*, *antiqua* and *forbesii*, have the palléal impression terminated in a sinus as in the American species. It may be necessary to remove these species from the old genus *Corbicula* and place them in the genus proposed for the American recent species of *Corbicula*.

The genus *Sphaerium* would I think be benefited by being divided into four genera, as follows:—

1. Shell solid, striæ deep, beaks rounded; example, *Sph. sulcatum; Sph. solidum* of Europe.
2. Shell somewhat solid, striæ light, beaks rounded; example, *Sph. rhomboideum; Sph. corneum* of Europe.
3. Shell delicate and pellucid, striæ not perceptible, beaks calyculate; example, *Sph. partumeium; Sph. lacustre* of Europe.
4. Shell very small, delicate, transverse, striæ very light, beaks calyculate; example, *Sph. bahiense; Sph. africanum* of South Africa.

These last proposed genera are based upon characters drawn from the shell alone; an examination of the soft parts of the first three proposed subdivisions is however now being made by my friend, Mr. Edward S. Morse, of Gorham, Maine. With regard to the fourth proposed subdivision, which I am very confident ought to constitute a separate genus, I regret to be obliged to state, that as yet, all my efforts to obtain alcoholic specimens of any of the species have been unsuccessful. The shell of the species of this

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group differs very materially from those of the first three, both in size and in shape. The species of this fourth group have hitherto been referred to the type species, the *Sph. bahiense*, or described as species of *Pisidium;* they are very widely and abundantly distributed through Central and South America and the West Indies, where they take the place of the species of the three first groups, none of which are found in those regions; one species inhabits South Africa. It is very desirable that the soft parts of the species of this group should be submitted to examination, and I beg to recommend myself to the good offices of naturalists collecting in the southern portion of this continent.

I take this opportunity to acknowledge my indebtedness to our late Mr. Cuming, of London, for his unprecedented liberality in allowing all the specimens of *Corbiculadæ* of his cabinet to cross the ocean for my inspection, affording me thereby the only possible means of identifying many of the species described in Europe from this country. My thanks are also due to Monsieur Deshayes, of Paris, for specimens of many of the species of *Corbiculadæ* from the Paris basin, by means of which I was enabled to compare the American species with the fossil ones of Europe. I am further under obligations to Mr. Hanley, of London, for having determined for me a species described by him from Central America; to Mr. Edward S. Morse for the able and faithful manner with which he has executed the drawings on wood inserted in the text of the monograph; to my correspondents abroad for the material which they have furnished me for instituting comparisons, and to my American correspondents for the assistance they have afforded me in determining the geographical range of the *Corbiculadæ* of America, by sending me specimens from all parts of the country.

It is scarcely necessary to add that I have had the full use of all the specimens of the Smithsonian Institution.

TEMPLE PRIME.

HUNTINGTON, L. I., N. Y.,
December, 1865.

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MONOGRAPH

OF

AMERICAN CORBICULADÆ.

Family CORBICULADÆ.[1]

Les conques (ex parte), Lamarck, 1809.—*Cycladèes*, Rafinesque, 1815.—*Les conques fluviatiles*, Lamarck, 1818.—*Veneriadæ*, Gray, 1818.—*Cycladia*, Rafinesque, 1818.—*Les Cyclades*, Férussac, 1822.—*Cycladine*, Latreille, 1825.—*Cycladæ*, Fleming, 1828.—*Cycladea*, Deshayes, 1830.—*Cyrenidæ*, Gray, 1840.—*Cycladacea*, Hinds, 1844.—*Cyclasidæ*, D'Orb., 1846.—*Corbiculadæ*, Gray, 1847.

Animal regular, mantle with the lobes free in front and at the base, ending in two short syphons united at their base and sometimes to the extremity; foot triangular, compressed, tongue shaped or cylindrical; tentacles of the mouth small, triangular, pointed; gills broad, unequal, united behind.

Shell regular, oval or subtrigonal, covered with an epidermis; hinge with two or three teeth in each valve; lateral teeth two, simple or striated; palleal impression simple or with a short sinus; ligament external.

The Corbiculadæ are divided into the following six genera:—

A. Cardinal teeth 3, 3, anterior of right and posterior of left valve smallest. Shell solid.

1. *Corbicula*, Megerle, 1811.—Shell subcordate; lateral teeth compressed, subequal, finely striated.
2. *Batissa*, Gray, 1852.—Shell subcordate; lateral teeth compressed, anterior very short, posterior elongate.
3. *Velorita*, Gray, 1834.—Shell cordate, triangular, thick, teeth large, lateral very finely striated, anterior very large, regular, hinder elongate, compressed.
4. *Cyrena*, Lamarck, 1818. Shell subcordate; lateral teeth smooth, front roundish, hinder rather compressed.

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[1] Proc. Zool. Soc. XV, 1847, 184.

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B. Cardinal teeth 2, 2, moderately diverging, front of right valve and hinder of left valve smaller; lateral teeth elongate, compressed, smooth; of right valve double, of left valve simple. Shell thin.

5. *Sphærium*, SCOPOLI, 1777.—Shell oblong, cordate, equilateral; syphon of animal separate, diverging at the tip.

6. *Pisidium*, PFEIFFER, 1821.—Shell ovate, wedge-shaped, inequilateral, truncated behind; syphons of animal short, united to the end.

CORBICULA, MEGERLE.[1]

Tellina, MÜLLER, 1774.—*Venus*, CHEMN. 1782.—*Cyclas*, BRUG. 1792.—*Corbicula*, MEGERLE, 1811.—*Cyrena*, LAMK. 1818.—*Venulites*, SCHL. 1820.

Animal.—"Mantle, lobes free on the lower edge and in front, united behind; edge simple, with a series of short conical beards just within the margin; syphons two, very short, separate, contractile; apertures fringed with short crowded conical beards; foot compressed, subquadrate, rather produced in front; body swollen; abductor muscles large, anterior oblong, the hinder round, subtrigonal.

"Labial tentacles 2 pair, large, broad, trigonal, equal; gills oblong, inner pair large, the outer about half the depth of the inner."—GRAY, MSS.

Shell oval or trigonal, subequilateral, heart-shaped; three diverging cardinal teeth in each valve; two lateral teeth compressed, narrow, very finely striated; beaks generally broad and not much raised; muscular impressions small, round, or elliptical; palleal impression variable.

This genus was instituted by Megerle[1] for a certain group of fresh-water bivalves, placed by Müller among the Tellina, and represented by the *Tellina fluminalis, fluviatilis, and fluminea.*

The *Corbicula* differ from the *Cyrena* proper, in having the lateral teeth very much elongated, narrow, both of nearly the same size, and very finely striated. The species of this genus are trigonal, and are, with the exception of *Corbicula woodiana*, as compared to the *Cyrena*, always small. The animal is similar to that of *Cyrena.*

[1] Berliner Mag. V, 1811, 56.

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This genus has of late years been very generally adopted by European conchologists. We do not find any living representative of this genus on the northern portion of this continent, the most northern extremity to which it extends being Mazatlan. As yet we know of no species from the West Indies, either living or fossil; in South America, on the contrary, they seem to exist in considerable abundance.

A peculiarity of the *Corbicula* found in America, which they share with our *Cyrena*, lies in the fact that the palleal impression always terminates in a sinus, whereas in the species from other regions it is simple.

1. Corbicula convexa, DESHAYES.—Shell orbicular, heart-shaped, inequilateral, solid; the anterior side the shorter; beaks tumid, rounded, opposite; lunula indistinct, ligament short, prominent; valves convex, the interior white; epidermis light-green; striæ irregular, delicate; three unequal cardinal teeth, the central bifid; lateral teeth nearly equal, narrow, delicately striated, palleal impression terminating in a small trigonal sinus.

Fig. 1.

C. convexa.

Long. .72; Lat. .66; Diam. .50 inch.
" 18; " 16; " 13 mill.

Hab. North America, at Mazatlan, in Mexico. (Cabinets of Cuming and Prime.)

Corbicula convexa, DESHAYES, Proc. Zool. Soc. XXII, 1854, 342.
Corbicula ventricosa, PRIME in litt.

I have never seen the original *C. convexa*, but have very little doubt from the description Mr. Deshayes gives of that species, that the shell in my cabinet, which I called *C. ventricosa*, is identical with it.

This species is easily distinguished by its globular shape, which renders it very different from all others; externally it is somewhat similar to the young of *Cyrena mexicana*.

2. Corbicula paranensis, DESHAYES.—Shell small, rounded-oval, somewhat inflated, inequilateral; anterior side short, rounded, posterior side somewhat abrupt; beaks small, inclined towards the anterior; valves full, strong, interior white; striæ very light, hardly visible; epidermis light-green; hinge-margin rounded, thick; three cardinal teeth, unequal, divergent; lateral teeth nearly equal, the anterior one a little arched, finely striated; palleal impression terminating in a small sinus.

Fig. 2.

C. paranensis.

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Long. .4; Lat. .34; Diam. .25 inch.
" 10; " 8; " 6 mill.

Hab. South America, in the Parana River. (Cabinets of the British Museum, Smithsonian Institution, and Prime.)

Cyrena paranacensis, D'ORB. Mag. de Zool. V, 1835, 44.
Cyclas paranensis, D'ORB. Voy. Amer. 1846, 567, pl. 83, f. 23—25.
Corbicula paranensis, DESHAYES, Brit. Mus. Bivalves, 1854, 231.

This small rounded species is somewhat similar in outline to some inflated species of *Sphærium*. It is remarkably robust for its size, and I know of no species of the same genus to which it has any very near affinity. Compared with *C. convexa*, it is very much smaller, less inflated, and proportionately more solid.

3. Corbicula obsoleta, DESHAYES.—Shell oval, trigonal, oblique, inflated, inequilateral, proportionately solid; anterior side broad, short, obtuse; posterior side subangular; beaks prominent, oblique; valves rather heavy; interior bright violet; epidermis olive-green, varying in shade in places; striæ heavy and irregular; hinge-margin narrow, three cardinal teeth, small, nearly parallel to each other; lateral teeth narrow, equal, the anterior tooth a little curved.

Fig. 3.

C. obsoleta.

Long. .70; Lat. .65 inch.
" 18; " 16 mill.

Hab. South America, in Uruguay. (Cabinet of Cuming.)

Corbicula obsoleta, DESHAYES, Proc. Zool. XXII, 1854, 345.—II. Conch. IX, 1861, pl. 2, f. 4.

In outline this species offers some similarity with *C. rotunda*, it is however larger and more solid. Compared with *C. convexa* it is more oblique and less inflated.

The only specimen I have seen of this species is the one in the collection of Mr. Cuming, which he kindly lent me for examination.

4. Corbicula rotunda, PRIME.—Shell rounded-oval, somewhat trigonal, moderately inflated, nearly equilateral; anterior side a little the narrower, sloping from the beaks, rounded, posterior side shorter, somewhat abrupt; beaks small, raised, inclined towards the anterior; valves rather higher than they are broad; striæ coarse; hinge thick, three unequal cardinal teeth; lateral teeth nearly equal, finely striated, the anterior curved.

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Long. .37; Lat. .37; Diam. .25 inch.
" 10; " 10; " 7 mill.

Hab. South America, in the Surinam River, Guyana. (Cabinets of the Academy of Natural Sciences of Philadelphia and Prime.)

Corbicula rotunda, PRIME, Pr. Acad. Nat. Sc. Ph. 1860, 80.

The only specimens I have seen of this species, those in Philadelphia and those in my own collection, are so worn that it is not possible to form any correct idea of the color of the epidermis, nor of the interior markings. Compared with *C. paranensis* it is more trigonal, longer from the beaks to the basal margin, transversely less broad and more inflated. It differs from *C. convexa* in being smaller, less rounded, higher and less inflated.

5. Corbicula limosa, DESHAYES.—Shell transverse, ovate-elliptical, inequilateral, compressed, somewhat tumid, comparatively solid, anterior side narrower, posterior shorter, subtruncated; striæ irregular; epidermis greenish; valves rather strong, inside white or of a deep violet; beaks tumid, inclined towards the interior; hinge-margin broad, with three unequal teeth; cardinal teeth diverging, the principal ones bifurcated; lateral teeth nearly equal in length, narrow, serrulated; palleal impression terminating posteriorly in a small trigonal sinus.

Fig. 4.

C. limosa.

Long. .87; Lat. .68; Diam. .50 inch.
" 22; " 18; " 13 mill.

Hab. South America, in the rivers of Eastern Uruguay. (Cabinets of the British Museum, Smithsonian Institution, Cuming and Prime.)

Tellina limosa, MATON, Trans. Linn. Soc. London, X, 1809, 325, pl. 24, f. 8–10.
Cyrena limosa, GRAY, Ann. Ph. n. ser., IX, 1825, 137.
Cyrena variegata, D'ORBIGNY, Guer. Mag. V, 1835, 44.
Cyclas variegata, D'ORBIGNY, Voy. Amer., 1846, 567, pl. 82, f. 14–16.
Cyclas limosa, D'ORBIGNY (error), loc. sub. cit. 1846, pl. 82, f. 14–16.
Corbicula semisulcata, DESHAYES, Proc. Zool. XXII, 1854, 343.
Corbicula limosa, DESHAYES, Biv. Brit. Mus. 1854, 231.

This well-marked species varies much in general appearance; some specimens are beautifully marked with light brown rays running from the beaks towards the basal margin, others do not exhibit these markings. The epidermis of the young shell is very

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smooth, at times glossy. The interior of the valves is either white or deep violet. Found not unfrequently.

I have never seen an original specimen of the *Tellina limosa*, but have no doubt, from an examination of the description given of it and of its figure, that it is the *Cyrena variegata*, D'Orb. With regard to the *Corbicula semisulcata*, Desh., with the habitat New Holland, of which I have received authentic specimens from Mr. Cuming, I can find no difference between it and the species under examination. I am convinced that the habitat assigned to the *Corb. semisulcata* is incorrect, from the fact that it has a sinus, a peculiarity confined to the *Corbiculadæ* of this continent.

This species is distinct from all other American ones of the genus in its elliptical and compressed shape.

6. Corbicula cuneata, DESHAYES.—Shell trigonal, very inequilateral, cuneiform, anterior side short, sloping, rounded; posterior side longer, subangular, inferior margin slightly rounded; beaks tumid, opposite, inclined towards the anterior, often eroded; valves solid, interior orange, pink or violet; striæ regular though deep; epidermis dark blackish or brownish-green, glossy; hinge-margin thick, three strong cardinal teeth; lateral teeth lightly striated, anterior curved, a little the shorter; palleal impression terminating in a small narrow sinus.

Fig. 5.

C. cuneata.

Long. .78; Lat. .68; Diam. .50 inch.
" 20; " 17; " 13 mill.

Hab. South America, in the Orinoco River. (Cabinets of Jonas, Cuming, Smithsonian Institution, Jay and Prime.)

Cyrena cuneata, JONAS, Zeit. Malak. 1844, 186.—Phil. Abb. II, 1846, 77, pl. 1, f. 6.
Cyrena globulus, JONAS, in litter.
Corbicula incrassata, DESHAYES, Proc. Zool. XXII, 1854, 342.
Corbicula cuneata, DESHAYES, Biv. Brit. Mus. 1854, 231.

This is a remarkably well characterized species not likely to be confounded with any other, the outline recalling somewhat that of the *Cyrena antiqua* of the Basin of Paris. I know of no recent species to which it is at all allied.

I have not seen any original specimen of the *Cyrena cuneata*, Jonas, but judging from the description and figure given of it in Philippi, I have no doubt that the specimens from which this de-

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scription was prepared, authentic *Corb. incrassata*, Desh., obtained from Mr. Cuming, from whose collection Mr. Deshayes described this species, are identical with it.

7. Corbicula brasiliana, Deshayes.—C. testa trigona, subtransversa, tumidula, inæquilaterali, tenuè et regulariter transversim striata, epidermide viridi nitente vestita; umbonibus minimis, prominulis, oppositis; latere antico paulo breviori, supernè rectilineo, declivi, postico parumper attenuato, rotundato; cardine angusto tridentato, altero bidentato, dentibus minimis divergentibus, lateralibus elongatis, angustis, sub lente exilime striatis; sinu pallii parvulo triangulari, apice acutissimo.

Hab. South America, at Para, in Brazil. (Cabinet of the British Museum.)

Corbicula brasiliana, Deshayes, Biv. Brit. Mus. 1854, 232.

I have not seen any specimens of this species.

Fossil Species.

8. Corbicula truncata, Prime.—C. testa cordata, inæquilatera, oblique truncata; sulcis transversis, latere antico angulato.

Long. .25 mill.

Hab. North America; (in the State of New York?). (Cabinets of the Garden of Plants in Paris and of Valenciennes.)

Cyrena truncata Lamarck, Anim. s. vert. V, 1818, 553.

I have never seen this species, which I am inclined to believe does not come from New York, but more probably from some of the Southern States. Mr. Deshayes says in the Encyclopédie Méthodique, that it bears such a close resemblance to *Cyrena cuneiformis*, that some of the valves of the two species actually fitted into each other.

9. Corbicula moreauensis, Meek and Hayden.—"Shell ovate, nearly elliptical, compressed, extremities rounded; anterior end narrower than the posterior, base semi-ovate, most prominent behind the middle; beaks not much elevated, placed a little in advance of the centre; surface marked with fine distinct lines of growth; cardinal edge rather thick, and having under the beaks three diverging central teeth in each valve, the anterior of which is the smallest; lateral teeth two (in the left valve) long, parallel to the cardinal edge, and fitting into corresponding grooves in the other valve; muscular impressions deep."

Long. 0.90; Lat. 0.66; Diam. 0.36 inch.

Hab. North America, near Moreau River, Nebraska. Tertiary formation. (Cabinet of the Smithsonian Institution.)

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Cyrena moreauensis, M. & H. Proc. Ac. N. S. Phil. 1856, 115.
Corbicula moreauensis, M. & H. Id. Oct. 1860, 432.

"Each of the cardinal teeth has, in its upper end, a small notch which is occupied, when the valves are closed, by a small projection between the teeth of the other valve. The anterior lateral tooth appears to be larger and approaches the central teeth more nearly than the posterior. Our specimens are generally more or less worn, and thickly coated with firmly adhering sand. Found in a sand-bed, near Moreau River, associated with bones of Titanotherium? Probably a distant outlier of the White River bone beds."—M. & H.

10. Corbicula nebrascensis, MEEK and HAYDEN.—"Shell ovalovate, compressed, rather thin; extremities rounded; base semi-elliptical; beaks moderately elevated, not gibbous, placed nearly half way from the middle to the anterior end; surface marked with fine lines of growth, occasionally rising into obscure concentric wrinkles; edge of the cardinal border thin; cardinal teeth close under the beaks, posterior one very oblique."

Long. 0.76; Lat. 0.68; Diam. 0.22 inch.

Hab. North America, near Moreau River, Nebraska. Tertiary formation. (Cabinet of Smithsonian Institution.)

Cyrena intermedia, M. & H. (preoc.), Proc. Ac. N. S. Phil. 1856, 116 (not *C. intermedia*, Melville, 1843).
Corbicula nebrascensis, M. & H. Proc. Acad. Oct. 1860, 432.

"This species approaches some varieties of *C. pisum*, but is more inequilateral, the posterior end being comparatively longer, the beaks are also less elevated. From the *C. moreauensis* it will be distinguished by its shorter and more rounded form, more elevated beaks, and much thinner cardinal edge."—M. & H.

11. Corbicula occidentalis, MEEK and HAYDEN.—"Shell subtriangular, very thick, rather ventricose; anterior end and base rounded, posterior end sloping abruptly from the beaks, and ventrically subtruncate at the extremity; beaks located a little in advance of the middle, and elevated, pointed, incurved and approximate; surface marked with strong lines of growth."

Long. 1; Lat. 1; Diam. 0.71 inch.

Hab. North America, at the Bad Lands of the Judith, Nebraska. Tertiary formation. (Cabinet of the Smithsonian Institution.)

Cyrena occidentalis, M. & H. Proc. Ac. N. S. Phil. 1856, 116.
Corbicula occidentalis, M. & H. Id. Oct. 1860, 432.

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"Appears to be intermediate between *C. cordata* of Morris and *C. antiqua*, both of which are Eocene species. From the first it differs in being relatively higher; its posterior end is also shorter, and more distinctly subtruncate. From the latter it differs in being less elevated, not so concave in front of the beaks, nor so regularly arcuate on the posterior slope from the beaks to the base. In front it presents the same symmetrical cordate outline common to both these species."—M. & H.

12. Corbicula cytheriformis, MEEK and HAYDEN.—"Shell broad, trigonal, ovate, varying to subcircular, rather thick and strong; extremities more or less rounded, base semi-ovate, usually more prominent before than behind the middle; dorsal outline sloping from the beaks, the anterior slope being more abrupt than the other and slightly concave, while the posterior is convex; beaks rather elevated, moderately gibbous, located in advance of the middle; surface marked by fine lines of growth, which sometimes show a very slight tendency to gather into small irregular concentric wrinkles."

Hab. North America, near the mouth of the Judith River, Nebraska. Tertiary formation. (Cabinet of Smithsonian Institution.)

Corbicula cytheriformis, M. & H. Proc. Ac. N. S. Phil. 1861, 176.

BATISSA, GRAY.[1]

Cyprina, Cyclas, BRUG. 1792.—*Cyrena,* LAMARCK, 1818.—*Venus,* GRAY.—*Batissa,* GRAY, 1852.

Animal oval, transverse; the lobes of the mantle simple or fringed, united posteriorly; two short syphonal tubes united at their base; foot compressed, oval, trigonal; mouth transverse, tentacles elongate, oval, trigonal, free; gills unequal, the inner ones larger subquadrangular, outer ones subtrigonal.

Shell oval, rounded or subtrigonal, thick, solid, hinge broad, three unequal, divergent cardinal teeth in each valve, the posterior tooth longest and narrowest; lateral teeth unequal, double in the right valve, narrow elongated, striated, anterior tooth shorter; ligament large, prominent, thick subcylindrical; muscular impressions large, lunular or circular; palleal impression simple.

[1] Ann. Mag. Nat. Hist., n. ser., IX, 1852, 34.

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The genus *Batissa* was established in 1852, by Mr. Gray, for a class of shells heretofore included under the genus *Cyrena*, and represented by the *Cyrena violacea*. The principal differences between the *Cyrena* proper and the *Batissa* are the following: the *Batissa* have compressed serrulated lateral teeth, the ligament is very large, rounded and prominent, the epidermis is dark and the palleal impression always simple. The hinge of the *Batissa* offers some analogy to that of the *Corbicula*, but is different in so far, that the anterior lateral tooth in *Batissa* is always short and much smaller than the posterior tooth.

The animal, according to Mr. Gray,[1] is similar to that of *Cyrena*.

The species of *Batissa*, very limited in number, are confined in their geographical distribution to the countries and islands of the Indian Ocean. I am not aware that as yet any have been found in a fossil state.

This new genus does not seem to have been received with much favor by conchologists, and more especially by those of the continent. Mr. Deshayes adopted it in 1854,[2] in describing some new shells from the Cuming Collection, but since then[3] he has changed his views on the subject. I was the first to bring it into notice in this country.[4]

(This genus is not represented on this continent.)

VELORITA, Gray.[5]

Cyrena, Gray, 1825.—*Venus*, Gray, 1828.—*Velorita*, Gray, 1834.

Animal not observed.

Shell trigonal, higher than broad, heart-shaped, thick, inflated, posteriorly angular; hinge broad, thick, three unequal cardinal teeth, compressed, a little oblique, anterior tooth in the right valve very short, posterior tooth in the left valve obsolete; lateral teeth very unequal, anterior tooth thick, short, transverse, very close to the hinge, posterior tooth elongate, lightly striated, remote from the hinge; muscular impressions rounded, equal; pal-

[1] Bivalves of the Brit. Mus. 1854, 234.
[2] Proc. Zool. XXII, 1854, 13.
[3] An. sans vert. basin de Paris, I, 1860, 484.
[4] Ann. N. Y. Lyceum, Nat. Hist. VII, 1860, 112.
[5] Griffith's Cuvier, 1834, pl. 31, f. v.

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leal impression ending in a very short sinus; ligament short, narrow.

This genus was established by Mr. Gray for a shell which he had previously described under the name of *Cyrena;* it differs very materially from the other genera of the family in its exterior shape and in the peculiar formation of the hinge. The valves are very thick, oblong, the beaks heart-shaped, and the lunula is very distinct and convex in the centre. The hinge is broad, it has three cardinal teeth, all inclined obliquely towards the posterior side, the anterior lateral tooth is very thick, prominent, and is placed very close to and at a right angle with the anterior cardinal tooth, the posterior lateral tooth is long, somewhat narrow, and to a certain extent similar to that of *Corbicula.*

We know of but one species of *Velorita,* a recent one from Japan, the *V. cyprinoides.*

Mr. Deshayes, who does not admit the validity of this genus, has discovered in the Basin of Paris certain forms of *Cyrena,* which would seem to establish a connecting link between *Velorita* and *Cyrena.*

(This genus is not represented on this continent.)

CYRENA, Lamarck.[1]

Venus, Chemn. 1769.—*Cyclas,* Brug. 1792.—*Cyrena,* Lam. 1818.—*Cyanocyclas,* Fer. 1818.—*Polymesoda,* Raf. 1820.—*Mactra,* Brongt. 1823.—*Geloina,* Gray, 1844.

Animal oval, transverse; mantle lobes free on the lower edge and in front, united behind into two short syphons; foot large, compressed, ovate, trigonal; tentacles elongate, ovate, trigonal; gills unequal, the internal ones subquadrangular, the external ones smaller, subtrigonal.

Shell oval or subtrigonal, thick, solid; three cardinal teeth in each valve somewhat divergent; two lateral teeth, unequal, the anterior one situated nearer the cardinal teeth; palleal impression variable.

The genus *Cyrena,* as originally constituted by Lamarck, was

[1] Lamarck, Anim. s. vert., V, 1818, 551.

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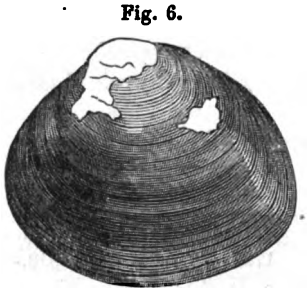
made to include several genera which have since been diverted from it—*Corbicula*, *Batissa* and *Velorita*. The genus, as now most generally received, embraces only the species of *Cyrena* with simple lateral teeth.

Cyrena in a living state are found in all tropical countries. The genus is represented at the present time in North America but by one species; in Central and in South America the species are numerous and bountifully distributed. I am not aware that, outside of America, any of the so-called Marine *Cyrena* have been found. A peculiarity of the *Cyrena* of this continent lies in the fact that the palleal impression is always terminated in a sinus, whereas in those from other parts of the world it is simple.

a. CYRENÆ *proper.*

1. Cyrena caroliniensis, LAMARCK.—Shell orbicular-trigonal, inequilateral; margins generally rounded; beaks obtuse, oblique, often eroded; striæ very fine; epidermis rough, of a grayish olive-green; valves moderately full, not heavy; interior white in adult, pale bluish in young, occasionally with markings of light violet on the margins and on the hinge; hinge-margin narrow; cardinal teeth small; lateral teeth short, obtuse; sinus very narrow, acute at extremity.

Fig. 6.



C. carolinienste.

Long. 1.44; Lat. 1.16; Diam. .94 inch.
" 38; " 33; " 25 mill.

Hab. North America, in the States of Alabama and Georgia. (Cabinets of the British Museum, Smithsonian Institution, Cuming, Jay, Prime and others.)

Cyclas caroliniensis, BOSC, Fer. Cat. Méth. 1807.
Cyclas caroliniana, BOSC, III, 37, pl. xxiii, f. 4.
Cyrena caroliniensis, LAM. An. s. vert. V, 1818, 558.—SAY, pl. 52.

This, our most common species of *Cyrena*, is not very liable to be confounded with any other; in exterior it bears some resemblance to *C. mexicana*, it differs, however, in being larger, more trigonal, the beaks are less prominent and the sinus is narrower and more acute. The young shell is less elongated transversely and more quadrangular than the adult.

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2. Cyrena sordida, HANLEY.—C. testa suborbiculari, crassa, subinaequilaterali, ventricosa aut tumida; epidermide olivaceo-fucescente et marginem ventralem convexum versus, luteo-virescente, concentrice rugulosa; margine dorsali postico, convexiusculo, declivi; natibus erosis, satis prominentibus; ligamento subinfosso; lunula nulla; superficie interne albida; dentibus lateralibus brevibus obtusis, antico magis approximato.

Long. 1.60; Lat. 1.50 inches.

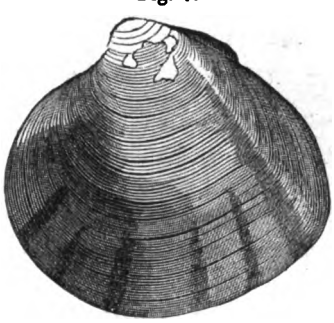
Hab. Central America. (Cabinet of Hanley.)

Cyrena sordida, HANLEY, Proc. Zool. XII, 1844, 159.—Index Test. Suppl. pl. xiv, f. 51.

I have not been able to identify this species. "The link between *C. caroliniensis* and *C. radiata*, uniting the interior and membranaceous wrinkles of the former to the general outline of the latter."—*Hanley.*

3. Cyrena radiata, HANLEY.—Shell rounded, somewhat oblique, heart-shaped, thick, solid, inequilateral, tumid, anterior side broad, rounded, posterior somewhat more extended, abrupt at extremity; beaks small, acute, approximate at apex, entire; striæ regular, epidermis light olive-green, shiny; interior of the valves violet; hinge-margin very much curved, thick; cardinal teeth unequal, divergent, the posterior teeth bifid at summit; lateral teeth unequal, the anterior tooth approximate, the posterior tooth elongated; sinus broad at mouth, acute at extremity, very short.

Fig. 7.



C. radiata.

Long. 1.40; Lat. 1.20, Diam. 1.00 inch.
" 42; " 39; " 28 mill.

Hab. In Central America, at Realejo, Nicaragua. (Cabinets of Hanley, the British Museum, Smithsonian Institution, Sowerby, Jay and Prime.)

Cyrena radiata, HANLEY, Proc. Zool. XII, 1844, 159.

The specimens from which this description was prepared were identified for me by the author himself. In some cases the epidermis of this species shows rays of a darker hue running from the beaks to the basal margin, this feature is, however, rather the exception than the rule. Compared with *C. arctata*, to which it

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bears great resemblance in outline, it is very much less full, transversely broader, and the epidermis is not so dark; it is very closely allied to *C. solida*. Found not unfrequently.

4. Cyrena solida, PHILIPPI.—Shell rounded, somewhat oblique, heart-shaped, thick, solid, inequilateral, very much inflated; anterior side rounded, posterior abrupt at extremity; beaks small, acute, curved inwards, appproximate at apex, entire; striæ regular, coarse; epidermis dusky greenish-brown; interior of the valves violet; hinge-margin curved, thick, cardinal teeth divergent, unequal, anterior ones bifid; lateral teeth unequal, anterior conical approximate, posterior narrow, elongated; sinus broad at mouth, short, acute at extremity.

Fig. 8.

C. solida.

Long. 1.2 ; Lat. 1.09; Diam. 0.7 inches.
" 34; " 31; " 23 mill.

Hab. Nicaragua and Balize. (Cabinets of Hanley, Smithsonian Institution and Prime.)

Cyrena solida, PHIL. Abbild. II, 1846, 78, pl. xv, f. 9.

This species is very closely allied to the *C. radiata*, with which it is often confounded, it is, however, smaller, more inflated, the striæ are not so regular, the epidermis is usually darker and without polish; some specimens exhibit on the epidermis the perpendicular rays common to *C. radiata* and *Corb. limosa*.

5. Cyrena triangula, v. d. BUSCH.—Shell solid, obliquely subtriangular, subequilateral, somewhat ventricose; posterior dorsal slope angular, anterior less so, ventral margin arcuate; beaks nearly central, elevated; pointed, incurved, generally perfect; exterior calcareous, comparatively smooth, covered with a light ashy-green epidermis; interior of the valves variable, sometimes entirely violet, at others white with violet on the margins or flesh color on the muscular impressions; hinge-margin thick, three unequal and rather small cardinal teeth; anterior lateral tooth short, acute, posterior elongate, compressed; sinus narrow, elongated.

Long. 2.25; Lat. 2.25 inches.
" 57; " 57 mill.

Hab. North America, at Mazatlan, Mexico. (Cabinets of the British Museum, the State of New York, Cuming and Gould.)

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Cyrena triangula, v. d. Busch, Philip. Abbild. III, 1849, 78, pl. 2, f. 3.
Cyrena altilis, Gould, Bost. Il. VI, 1852, 400, pl. xvi, f. 5, bis.
Cyrena varians, Carpenter (pars), Mazatlan Shells, 1857, 115.
Cyrena mexicana, Carpenter (pars), loc. sub. cit. 1857, 115.

Under the description of *C. mexicana* will be found a statement of my reasons for separating these two species, which have been confounded by Mr. Carpenter. The *C. altilis*, Gould, which I consider identical with this species, differs a little from v. d. Busch's original type of *C. triangula* as figured in Philippi, in being smaller, a little more swollen, and in having more prominent and more acute beaks; in the main, however, it is the same shell.

Compared with *C. radiata* it is less solid, larger, more triangular, the surface is smoother and the cardinal teeth are more delicate; it differs from *C. olivacea* in being more triangular, less elongated, more inflated, the epidermis is thinner and the cardinal teeth are more delicate.

Mr. Reigen seems to have found this species in abundance.

6. Cyrena obscura, Prime.—Shell subtrigonal, heart-shaped, inflated, solid, tumid, subequilateral; anterior side rounded; posterior broader, rounded, subtruncated at extremity; beaks large, prominent, slightly eroded; valves heavy, full, interior white with markings of violet on the margins; striæ regular, deep; epidermis blackish-brown; hinge-margin curved, moderately broad; cardinal teeth unequal, divergent; lateral teeth elongated, narrow, anterior tooth nearer the cardinal teeth, larger, acute.

Long. 1.80; Lat. 1.70; Diam. 1.06 inches.
" 48; " 44; " 33 mill.

Hab. South America. (Cabinet of Cuming.)

Cyrena obscura, Prime, Proc. Zool. XXVIII, 1860, 321.

The only specimen I have seen of this species is the one in Mr. Cuming's collection. Compared with *C. insignis*, it is much less inflated and more equilateral; it is fuller and transversely less elongated than *C. olivacea*.

7. Cyrena insignis, Deshayes.—Shell ovate-cordiform, thick, coarse, inequilateral; anterior side somewhat the shorter, broadly rounded; posterior side broad, truncate, obtusely angular; beaks large, tumid, somewhat oblique, opposite, eroded; striæ coarse, irregular more numerous on

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the margins; epidermis dark brownish-green; hinge-margin curved; cardinal teeth strong, unequal, divergent; anterior lateral tooth large, broad, conical; posterior lateral tooth situated at a greater distance from the cardinal teeth, narrow, small; interior of the valves white or pale salmon color, with at times markings of violet on the margins; sinus very narrow, deep, ascending in a direction oblique to the beaks.

Fig. 9.

C. insignis.

Long. 1.75; Lat. 1.56; Diam. 1.43 inches.
" 45; " 40; " 36 mill.

Hab. North America, in the State of California. (Cabinets of Cuming and Prime.)

Cyrena insignis, DESH. Proc. Zool. XXII, 1854, 20.—Il. Conch. IX, 1861, 39, pl. 2, f. 2.

This species, which is quite rare, the only specimens known being the one in Mr. Cuming's collection and that in mine, does not present many points of similarity with any others.

8. Cyrena arctata, DESHAYES. — Shell trigonal, inflated, heart-shaped, heavy, inequilateral; anterior side short, somewhat angular; posterior side subtruncated; beaks large, oblique, generally eroded; striæ heavy, regular; epidermis blackish-green; interior of the valves white or pale rose-color with at times markings of pale violet on the muscular impressions; sinus short and broad; hinge-margin strong; cardinal teeth small, simple; lateral teeth subequal, prominent.

Fig. 10.

C. arctata.

Long. .86; Lat. .86; Diam. .68 inch.
" 35; " 35; " 28 mill.

Hab. South America, in Lake Maracaibo. (Cabinets of Cuming, Smithsonian Institution, Jay, Swift, Bland and Prime.)

Cyrena arctata, DESH. Proc. Zool. XXII, 1854, 20.

This species, though found in great abundance in the waters of Lake Maracaibo, has not to my knowledge been collected in other localities. Compared with *C. radiata*, to which it bears some resemblance in marginal outline, it differs in being somewhat smaller, very much more ventricose and more solid; the beaks are larger

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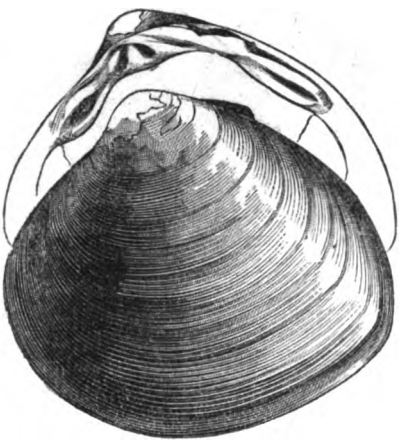
and more full and the epidermis is darker and without any perpendicular radiations.

9. Cyrena fortis, PRIME.—Shell trigonal, tumid, solid, inequilateral; anterior side shorter, rounded; posterior side subtruncated; valves moderately full, interior dark violet; beaks large, inclined anteriorly, approximate at apex, slightly eroded; striæ deep, regular, epidermis shiny, varying from green to brownish-green; hinge margin somewhat broad, curved; cardinal teeth unequal, divergent, simple; lateral teeth strong, anterior tooth nearer to the cardinal teeth, conical, posterior tooth, elongated; sinus deep, curved and acute at extremity.

Long. 2.38; Lat. 1.77; Diam. 1.22 inches.

Long. 62; Lat. 47; Diam. .32 mill.

Fig. 11.



C. fortis.

Hab. South America, in Ecuador. (Cabinets of Smithsonian Institution and Prime.)

Cyrena fortis, PRIME, Il. Conch. IX, 1861, 355—X, 1862, 387, pl. xiv, f. 2.

This fine and rare shell presents great similarity to *C. radiata*, it differs, however, in being larger, less equilateral, transversely longer, the beaks are a little fuller, the hinge is not so strong or so broad and the epidermis has more lustre; the perpendicular radiations common to some specimens of *C. radiata* are wanting.

10. Cyrena olivacea, CARPENTER.—Shell irregular, subtrigonal, somewhat compressed, subequilateral; anterior side shorter, rounded, posterior narrower, very angular; beaks large, prominent, inclined towards the anterior; valves very little convex, interior violet, darker on the margins; exterior surface irregular, striæ coarse; epidermis rich olive-green; hinge-margin much curved, three unequal rather small cardinal teeth;

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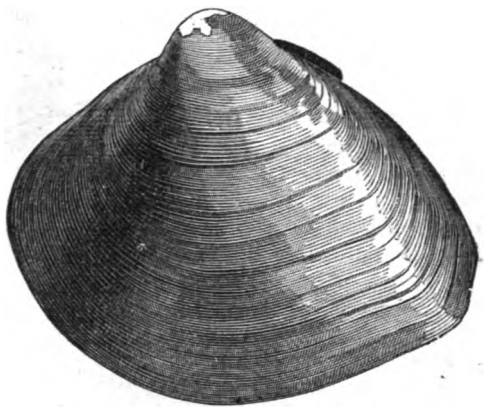
anterior lateral tooth quite prominent, posterior shorter than usual; sinus very narrow, rather straight.

Fig. 12.



C. olivacea.

Long. 2.50; Lat. 2.06; Diam. 1.25 inches.
" 63; " 52; " 32 mill.

Hab. North America, at Mazatlan, in Mexico. (Cabinets of the British Museum, Smithsonian Institution, State of New York, Cuming and Prime.)

Cyrena fontaineii, PHILIPPI, Zeit. Malak. 1851, 70.—DESH. Brit. Mus. Cat. 1854, 253.
Cyrena olivacea, CARP. Mazatlan Shells, 1857, 114.

Philippi and Deshayes have both confounded this species with the *C. fontaineii* of D'Orbigny, which is a more regularly formed shell with very regular striæ and with an even epidermis.

Mr. Carpenter, in speaking of the *C. olivacea*, says it is known outwardly by its flattened form, by its rich olive-green epidermis covering the umbos and rising into irregularly corrugated folds, which are very close on the anterior part. The interior displays a very dark purple over the greater part of the surface. The outline varies considerably. So far this species has not been found in any abundance.

11. Cyrena regalis, PRIME.—Shell small, subtrigonal, subequilateral, somewhat compressed, transversely short; anterior side rounded, posterior side forming a declivity from the beaks, somewhat produced, subabrupt at extremity; beaks nearly central, small, not much raised,

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approximate at apex, eroded; striæ deep, very regular; valves solid, interior light violet; epidermis light olive-green; hinge-margin slightly curved, broad; cardinal teeth strong, unequal, divergent, the posterior ones bifid; lateral teeth unequal, depressed, posterior distant; sinus irregular in shape, long and tapering at extremity.

Fig. 13.

C. regalis.

Long. 0.76; Lat. 0.73; Diam. 0.43 inches.
" 19; " 18; " 10 mill.

Hab. South America? (Cabinet of Prime.)

A rare and pleasing species, the striæ are deep and very regular, which distinguish it from others; it is smaller, less inflated and transversely shorter than *C. solida*, the posterior margin is more produced at the extremity, the sinus is longer, the striæ are more regular and the epidermis is of a lighter color.

12. Cyrena meridionalis, PRIME.—Shell small, subquadrangular, compressed, subequilateral; anterior side semi-circular, a little produced; posterior side subabrupt; beaks small, inclined anteriorly, approximate at apex, eroded; striæ delicate, rather irregular; epidermis light brownish-green; valves solid, interior light violet; hinge-margin slightly curved; cardinal teeth strong, unequal, divergent, central tooth bifid; lateral teeth compressed, small, subequal; sinus narrow, curved at extremity.

Fig. 14.

C. meridionalis.

Long. 1.40; Lat. 1.32; Diam. 0.92 inches.
" 35; " 33; " 23 mill.

Hab. South America, at Payta, in Peru. (Cabinet of Prime.)

The external appearance of this species brings it near *C. ordinaria;* it is, however, much more transverse, and the hinge-margin is broader and less curved. A rare species.

13. Cyrena ordinaria, PRIME.—Shell small, trigonal, transversely very short, compressed, subequilateral; anterior side semi-circular; posterior side rounded from the beaks downwards, subabrupt at extremity; beaks prominent, small, inclined anteriorly, approximate, eroded; striæ fine, irregular, epidermis light brownish-green; valves solid, interior light violet; hinge-margin curved, broad; cardinal teeth unequal, divergent,

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Fig. 15.

C. ordinaria.

anterior tooth in the right valve rudimentary, central slightly bifid; lateral teeth compressed, the cavity of the anterior tooth in the right valve united to the cardinal by a well-defined fissure; anterior tooth approximate; sinus short, curved at end.

Long. 0.86; Lat. 0.90; Diam. 0.53 inches.
" 21; " 22; " 13 mill.

Hab. South America? (Cabinet of Prime.)

Compared with *C. regalis*, it is larger, transversely shorter, less heavy, less produced on the posterior side, fuller, the beaks are more prominent, the striæ are less regular and more delicate, the epidermis is not so greenish in color. Smaller and less full than *C. radiata* and *C. solida*. A rare species.

14. Cyrena nitidula, DESHAYES.—Shell transversely oval, fragile, inequilateral; anterior side shorter, rounded at end; posterior side rounded or subtruncated; striæ light; epidermis greenish; beaks tumid, acute, opposite; valves light, somewhat compressed; interior pale violet; sinus short, triangular, acute; hinge-margin very narrow; cardinal teeth unequal, divergent, narrow, bifid; lateral teeth subequal, small.

Long. 1.12; Lat. 1.00; Diam. 0.68 inches.
" 28; " 25; " 17 mill.

Hab. South America? (Cabinet of Cuming.)

Cyrena nitidula, DESHAYES, Proc. Zool. XXII, 1854, 23.

The specimen in the collection of Mr. Cuming, from which this description was prepared, has no locality assigned to it; the fact of its having a sinus places it without a doubt among the species from America, and I am strongly inclined to think that it is a native of South America.

15. Cyrena placens, HANLEY.—C. testa suborbiculari, subventricosa, inæquilaterali, nitida, concentrice, sulcato-striata, epidermide irridoflavescente induta; margine ventrali convexo; dorsali, utrinque declivi et convexiusculo; natibus erosis; ligamento fulvo, depresso, angusto; lumula nulla; superficie interna purpurea; dentibus lateralibus minutissime rugulosis haud autem crenatis, antico brevi et subapproximato.

Long. 1.75; Lat. 1.50 inches.

Hab. South America? (Cabinets of Hanley and the Jardin des Plantes.)

Cyrena placens, HANLEY, Proc. Zool. XII, 1844, 160.—Index test. suppl. pl. xiv, f. 52.

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I have not been able to identify this species, which Mr. Hanley informs me is very rare, the shell labelled as such in the cabinet of Mr. Cuming, he says is not the true *C. placens.*

"A beautiful and rare species, of which I have never seen but my own specimen and that in the Jardin des Plantes at Paris. The sulci are close and regular, and the outline of the shell, although not very unlike that of *C. radiata*, is convex in front of the beaks, thus rendering the front extremity broad and somewhat obtuse."—*Hanley.*

I have reason to believe that this species is closely allied to *C. fontaineii.*

16. Cyrena fontaineii, CARPENTER.—Shell trigonal, solid, compressed, inequilateral; anterior side short, rounded; posterior narrow; acute and angular at extremity; beaks small, acute, eroded; striæ fine, regular, epidermis smooth, chestnut-brown; interior of the valves light-blue; hinge-margin curved, thick; cardinal teeth large, unequal, divergent, the anterior ones bifid; lateral teeth unequal, anterior proximate, conical, posterior distant, elongated, compressed.

Fig. 16.

C. fontainei.

Long. 1.66; Lat. 1.40; Diam. 0.80 inches.
" 41; " 35; " 20 mill.

Hab. South America. (Cabinets of Cuming, Jay and Prime.)

Cyclas fontaineii, D'ORB. Voy. Amer. 1844, 569, pl. 83, f. 14, 15.
Cyrena fontaineii, CARP. Mazatlan Shells, 1857, 114.

Compared with *C. olivacea*, with which this species has been confounded, its outline is more regular, it is smaller, more compressed, the beaks are smaller and more acute, the epidermis is smoother and of a different color. A rare species.

17. Cyrena acuta, PRIME.—Shell trigonal, oblique, transversely elongated, very inequilateral, somewhat compressed, solid; anterior side short, rounded at end; posterior side produced, angular at end; beaks tu

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mid, inclined anteriorly, approximate at apex, somewhat eroded; striæ heavy, very regular; epidermis light brown; valves thick, interior variable, pale salmon or dark violet; hinge-margin curved, moderately broad; cardinal teeth unequal, divergent, simple; lateral teeth elongated, subequal, posterior tooth a little more elongated and depressed and slightly more distant from the cardinal teeth; sinus narrow, curved and acute at extremity.

Fig. 17.

C. acuta.

Long. 1.64; Lat. 1.44; Diam. 0.88 inches.

Long. 41; Lat. 36; Diam. 22 mill.

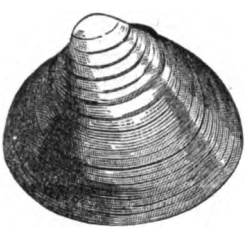
Hab. Central America. (Cabinet of Prime.)

Cyrena acuta, PRIME, Il. Conch. IX, 1861, 355—X, 1862, 387, pl. xiv, f. 1.

A rare and fine species, easily distinguished from others by the great prolongation of the posterior side.

18. Cyrena mexicana, SOWERBY.—Shell small, rounded oval or elliptical, subequilateral; anterior side a little the shorter, broader, rounded, posterior side narrower, subangular at end; beaks medium size, somewhat raised, inclined towards the anterior, generally eroded; valves moderately convex, interior white, with at times purple markings on the margins and on the hinge; epidermis very variable, rough or smooth, color dingy gray or light yellowish-green; striæ generally light; hinge thick, three unequal cardinal teeth; the anterior lateral tooth acute, short, the posterior elongated; sinus long and narrow.

Fig. 18.



C. mexicana.

Long. 1.25; Lat. 1.12; Diam. 1.18 inches.
" 32; " 28; " 29 mill.

Hab. North America, at Mazatlan and Panama. Guyana? (Cabinets of the British Museum, Smithsonian Institution, Cuming, State of New York, and Prime.)

Cyrena mexicana, SOWB. Zool. Il. 1829, 364.—CARP. (pars) Mazatlan Shells, 1857, 115.

Cyrena fragilis, DESHAYES, Mus. Cuming.

Cyrena æquilateralis, DESHAYES, Proc. Zool. XXII, 1854, 20.

Cyrena varians, CARPENTER, in litt.

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This species varies very much in external appearance, being, at times, more convex than the specimen from which this description was prepared; I have a young *C. mexicana* which is quite globose. The epidermis is usually light yellowish-green and smooth, but in some cases it is of a dingy gray color and rough.

The original type of Mr. Sowerby's *C. mexicana* having been lost, some confusion has arisen as to the identification of this species; the description he gives of it, though quite short, contains sufficient, taking the locality into consideration, to induce me to believe that the shell under consideration is the one he had in view in describing his species.

Mr. Carpenter includes under the head of *C. mexicana* the *C. altilis*, Gould, or rather the *C. triangula*, v. d. Busch, as it should be called, both being identical. I have examined an original specimen of *C. altilis*, and am convinced that it is different from *C. mexicana*. I have also examined, at the State Collection in Albany, a complete suite of *C. mexicana* arranged by Mr. Carpenter himself, and find that though at times certain extreme forms of *C. mexicana* and *C. triangula* bear great affinities to each other, the two types are very distinct and may be separated without much trouble. The *C. triangula* is always more triangular, larger and more solid than *C. mexicana*, and its beaks are more prominent.

The *C. floridana*, which Mr. Carpenter places under the synonymy of this species, is an entirely different shell.

I have seen original specimens of *C. fragilis*, Desh., and of *C. æquilateralis*, Desh., in the Cuming Collection, and find them identical with *C. mexicana*. The *C. æquilateralis* is assigned as coming from Guyana, an error, in my opinion. The *C. mexicana* is, on the whole, an attractive species; it is found quite abundantly.

19. Cyrena californica, Prime.—Shell ovate-subquadrangular, transverse, inequilateral, tumid, somewhat heavy; anterior side produced towards the upper part, obliquely subtruncate, posterior side broadly truncated towards the upper part and angular towards the inferior part, basal margin rounded; beaks not much raised, somewhat oblique, eroded; striæ light, irregular; epidermis yellowish-green; valves white inside with violet on the margins; hinge-margin somewhat broad; cardinal teeth divergent, narrow, approximate at base; lateral teeth unequal: anterior tooth thick, conical, short; posterior tooth narrow, placed at a greater distance from the cardinal teeth.

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Long. 1.81; Lat. 1.56; Diam. 1.20 inches.
" 45; " 39; " 30 mill.

Hab. North America, in the State of California. (Cabinet of Cuming.)

Cyrena subquadrata, Desh. (preoc.) Proc. Zool. XXII, 1854, 21.
Cyrena californiensis, Prime, Proc. Ac. N. S. Phil. 1860, 276.

The only specimen I have seen of this rare species is the one in the collection of Mr. Cuming. In shape this shell is somewhat like that of the *C. radiata*, but otherwise they are widely distinct; it is very different from all other species of the genus.

20. Cyrena panamensis, Prime.—Shell orbicular-subtrigonal, heart-shaped, ventricose, inequilateral; anterior side short, concave on the upper part, produced and rounded in front; posterior side broader, obliquely truncated, obtuse at extremity; beaks large, very prominent, opposite, approximate at apex; striæ light, irregular; epidermis brownish-green; hinge-margin very narrow; cardinal teeth unequal, small, divergent; anterior lateral tooth thicker than the posterior.

Long. 2.20; Lat. 2.08; Diam. 1.68 inches.
" 55; " 52; " 42 mill.

Hab. Central America, at Panama. (Cabinets of the British Museum and Cuming.)

Cyrena inflata, Deshayes, (preoc.) Proc. Zool. XXII, 1854, 23.
Cyrena panamensis, Prime, Proc. Ac. N. S. Phil. 1860, 283.

A rare shell, the only specimen I have seen is the one from Mr. Cuming's collection. Compared with *C. cumingii* it is smaller, more tumid, transversely less elongated; it differs from *C. maritima* in being more tumid, transversely shorter, and in having more prominent beaks.

21. Cyrena recluzii, Prime.—Shell heart-shaped, inflated, subequilateral, tumid; anterior side rounded; posterior side subtruncate; beaks prominent, inclined anteriorly, approximate at apex; lunula obsolete; striæ irregular; epidermis dark brownish-green; valves solid, full, interior whitish; hinge-margin curved, broad; cardinal teeth unequal, divergent, bifid; anterior lateral tooth narrow, robust, nearer the cardinal teeth; posterior tooth lamellar, distant.

Fig. 19.

C. recluzii.

Long. 2.96; Lat. 2.96; Diam. 2.20 inches.
" 74; " 74; " 55 mill.

Hab. Central America. (Cabinet of Cuming.)

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Cyrena cordiformis, Recluz, (preoc.) Il. Conch. IV, 1853, 251, pl. vii, f. 9.

The only specimen I have seen of this species, is the one in the cabinet of Mr. Cuming. Mr. Recluz does not assign any locality to it, but I am satisfied on careful inspection that it comes from Central America. Compared with *C. inflata*, it is heavier, more inflated and more heart-shaped.

22. Cyrena cumingii, Deshayes.—Shell ovate-subtrigonal, inequilateral, tumid, heart-shaped; anterior side short, broadly rounded; posterior side longer, truncated at extremity; beaks large, prominent, opposite, approximate at apex, eroded; valves rather solid, interior white; striæ light and irregular; epidermis brownish-green; hinge-margin narrow, somewhat broad in the centre; cardinal teeth approximate, narrow, unequal, bifid; lateral teeth large, equidistant from the cardinal teeth, anterior tooth larger, conical, acute.

Long. 2.40; Lat. 2.08; Diam. 1.76 inches.
" 60; " 52; " 44 mill.

Hab. Central America. (Cabinet of Cuming.)

Cyrena cumingii, Deshayes, Proc. Zool. XXII, 1854, 22.

A rare shell, the only specimen I have met with is the one in Mr. Cuming's collection. Compared with *C. maritima*, it differs in having an epidermis, in being larger, transversely more elongated and less inflated.

23. Cyrena isocardioides, Deshayes.—Shell orbicular-subtrigonal, inflated, heart-shaped, light, fragile; anterior side a regular and broad semicircle; posterior side forming on the upper part a declivity, subtruncated at extremity; striæ light, irregular; epidermis olive-color with zones of black; beaks large, curved inwards, opposite, tinted with violet; hinge-margin very narrow; cardinal teeth very small, approximate, subequal, the two anterior ones parallel, the posterior divergent; lateral teeth small, situated at about the same distance from the cardinal teeth; valves white inside, with markings of violet on the margins.

Long. 2.16; Lat. 2.12; Diam. 1.60 inches.
" 54; " 53; " 41 mill.

Hab. South America, in Western Columbia. (Cabinet of Cuming.)

Cyrena isocardioides, Desh. Proc. Zool. XXII, 1854, 22.

A rare species, the only specimen I have seen is the one in Mr. Cuming's collection; it presents great affinity to *C. recluzii* in

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shape and bulk; it differs, however, in being very much less heavy and solid; the hinge-margin is narrower and the teeth are smaller and slighter.

24. Cyrena tumida, PRIME.—Shell trigonal, inflated, equilateral, somewhat solid; anterior margin convex, obtuse, subangular; posterior margin convex, presenting a declivity on the upper part, angular, subrostrated; inferior margin ventricose; epidermis dark; beaks very small, depressed, opposite; hinge-margin narrow; cardinal teeth small, narrow, the two larger ones bifid; lateral teeth unequal, compressed, the anterior one large, acute, triangular; valves white in the interior with a rosy hue.

Long. 1.36; Lat. 1.20; Diam. 0.80 inches.
" 34; " 30; " 20 mill.

Hab. Central America. (Cabinet of Cuming.)

Cyrena angulata, DESH. (preoc.) Proc. Zool. XXII, 1854, 22.

The only specimen I have seen of this species is the one in the collection of Mr. Cuming.

25. Cyrena pullastra, MÖRCH.—C. testa ovalis, tenuis, albescens, radiatim subtilissime striata, valde inæquilateralis, convexiuscula, antice brevissime angustata, postice late rotundata, margo dorsalis anticus precipite declivis, posticus rectus fere horizontalis, postice angulo obtuso; margo ventralis parum arcuatus; area postice violacea tincta; dens lateralis posticus valvæ sinistræ remotissimus, compressus, inter laminas 2 valvæ dextræ receptus; dens anticus subapproximatus; sinus syphonalis angustissimus, sursum spectans.

Long. 30; Lat. 23 mill.

Hab. Central America, at Realejo in Nicaragua. (Cabinet of Mörch.)

Cyrena (Polymesoda) pullastra, MÖRCH, Malak. Bl. VII, 1860, 194.)

I have not been able to identify this species. I know of no *Cyrena* from Realejo to which the above description would apply.

26. Cyrena inflata, PHILIPPI.—C. testa ovato-trigona, valde tumida, tenui, irregulariter transversim striata, epidermide olivaceo-nigrescente vestita; extremitate postica elongata; apice subtruncata; margine ventrali parum arcuato; apicibus valde prominentibus, involutis, decorticatis; dentibus cardinis lateralibus integris, in valva dextra abrupte terminatis; pagina interna alba.

Long. 28½‴; Alt. 26½‴; Crass. 21½‴.

Hab. Central America, in Costa Rica. (Cabinet of v. d. Busch.)

Cyrena inflata, PHILIPPI, Zeit. Malak. 1851, 71.

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"Species forma inflata, testa tenui, apicibus prominentibus ab affinibus valde recedit, et *Isocardiam cor* in mentem vocat."

I have not been able to identify this species.

27. Cyrena boliviana, PHILIPPI.—C. testa subtrigona, valde inæquilatera, regulariter transversim undato sulcata, epidermide olivacea vestita, extremitate antica rotundata, postica acute angulata rostrata; margine dorsali postico longissimo, parum arcuato; medio lunulæ tumido; apicibus integris; dentibus lateralibus abbreviatis integris; cardinalibus integris; pagina interna violaceo-suffusa; sinu palliari distincto angusto.

Long. 16‴; Alt. 14‴; Crass. 8‴.

Hab. South America, in Bolivia. (Cabinet of Largilliert.)

Cyrena boliviana, PHILIPPI, Zeit. Malak. 1851, 70.

I have not been able to identify this species.

b. ANOMALOUS SPECIES.

28. Cyrena maritima, C. B. ADAMS.—Shell orbicular-heart-shaped, inequilateral, solid; anterior side short, rounded; posterior side produced, truncated at extremity; beaks large, inclined anteriorly, approximate at apex, acute, not eroded; valves very full, whitish inside; striæ coarse, irregular; epidermis greenish-brown, worn on the upper portion of the shell; hinge-margin narrow, not much curved; cardinal teeth small, narrow, subequal, divergent, bifid; lateral teeth depressed, at about the same distance from the cardinal teeth, a small narrow indentation leads from the anterior tooth to the cardinal teeth; sinus not distinguishable.

Fig. 20.

C. maritima.

Long. 2.26; Lat. 1.94; Diam. 1.44 inches.
" 56; " 48; " 36 mill.

Hab. Central America, at Panama. (Cabinets of Amherst College, Cuming and Prime.)

Cyrena maritima, C. B. ADAMS, Ann. N. Y. Lyc. V, 1852, 499.

The late Professor Adams, from whom I obtained my specimen of this species, says of it, "its station is in impalpable mud under bushes at high-water mark where a small stream emptied; some of the dead shells have balani growing upon them; nine specimens were collected at two-and-a-half miles east of Panama."

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Like all the species of this genus which live in estuaries, it is nearly entirely deprived of epidermis, some few remnants of it only existing on the margins of the shell. The *C. maritima* is very much larger than any of the so-called marine *Cyrenæ* known to us, and is not likely to be confounded with any of them.

29. Cyrena notabilis, Deshayes.—Shell transversely rounded, subquadrilateral, somewhat depressed, inequilateral; anterior side short, obtuse; posterior side broadly truncate; superior and inferior margins straight, parallel; beaks oblique, not eroded, approximate at apex; striæ light, irregular; epidermis greenish; valves solid, interior white with a broad patch of dark violet on the upper portion of the posterior margin; ligament elongated, cylindrical; cardinal teeth unequal, oblique, bifid; anterior lateral tooth small, conical, posterior tooth somewhat obsolete, more distant from the cardinal teeth.

Long. 2.31; Lat. 1.87; Diam. 1.43 inches.
" 58; " 48; " 37 mill.

Hab. South America, in Peru. (Cabinet of Cuming.)

Cyrena notabilis, Desh. Proc. Zool. XXII, 1854, 21.

Mr. Cuming possesses the only specimen I have seen of this species, which is found at the mouths of rivers. Compared with *C. obscura* it is more quadrangular and less tumid; it differs very materially from *C. maritima* and *C. anomala,* and it is much larger and heavier than any other of the estuarian species.

30. Cyrena floridana, Conrad.—Shell trigonal, inequilateral, cuneiform; anterior side the shorter, somewhat produced, rounded; posterior side angular, subtruncate at end, with an obtuse fold near the margin; basal margin curved, irregular; beaks small, approximate at apex, curved inwardly, entire; lunula somewhat marked; striæ irregular, coarse especially towards the posterior margin where they assume the shape of folds; epidermis wanting; hinge-margin very much curved; cardinal teeth subequal, divergent; anterior lateral tooth sharp; posterior lateral tooth narrow, elongate; valves solid, moderately inflated, exterior pale violet, interior rough, whitish pink with dark violet bands on the margins; sinus not visible.

Fig. 21.

C. floridana.

Long. 1.12; Lat. 0.81; Diam. 0.48 inches.
" 28; " 20; " 12 mill.

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Hab. North America, at Tampa Bay, in the State of Florida. (Cabinets of Phillips and Prime.)

Cyrena floridana, CONRAD, Proc. Ac. N. S. Phil. III, 1846, 23, pl. 1, f. 1.

This species has no epidermis, and presents many of the characters of a marine shell; compared with *C. salmacida*, which is about of the same size, it differs in being irregular in outline, less elongated and of a somewhat different color; it is smaller and coarser than *C. maritima*, and larger than either *C. colorata* or *C. cubensis*.

31. Cyrena cubensis, PRIME.—Shell small, trigonal, compressed; anterior side short, rounded; posterior side produced, subangular; beaks small, raised, inclined towards the anterior, not eroded; striæ fine; epidermis wanting; color violet; hinge-margin broad; cardinal teeth diverging; valves solid, interior salmon color.

Long. 0.60 inch.
" 15 mill.

Hab. North America, in the Island of Cuba. (Cabinet of ?.)

Cyclas maritima, D'ORB. Moll. Cuba, II, 1853, 280, pl. xxi, f. 47–50.

This species presents the appearance of a marine shell; compared with *C. floridana* it is smaller and more regular in outline; it is larger and more solid than *C. colorata;* it is smaller, less inflated and more highly colored than *C. maritima*, and smaller and more inflated than *C. salmacida*.

32. Cyrena salmacida, MORELET.—Shell inequilateral, oval, solid, elongated; anterior side short, rounded; posterior elongated, subabrupt at end; beaks small; striæ irregular, not heavy; epidermis wanting, exterior of valves whitish or flesh-colored; hinge-margin narrow; cardinal teeth small; lateral teeth small, elongated.

Fig. 22.

C. salmacida.

Long. 1.08; Lat. 0.76 inches.
" 27; " 19 mill.

Hab. Central America, near the Port of Sisal, in Yucatan. (Cabinets of Morelet and Cuming.)

Cyrena salmacida, MORELET, Test. nov. Cub. pt. 2, 1851, 26.

The specimens collected by the author, which have passed through my hands, were found in salt-water marshes. A rare

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species. In outline it offers some resemblance with *C. colorata*, it is, however, larger, more inflated and very much more solid.

33. Cyrena colorata, Prime.—Shell very small, fragile, elongated, cuneiform, very inequilateral, compressed, anterior side broader, rounded; posterior side longer, produced, subabrupt at extremity; beaks small, acute; striæ very fine, hardly visible; color variable, whitish with zones of purple, or orange; epidermis wanting; hinge-margin nearly straight, narrow, teeth small and delicate; cardinal teeth unequal, divergent, anterior tooth rudimentary, posterior ones bifid; lateral teeth unequal, elongated, narrow.

Fig. 23.

C. colorata.

Long. 0.80; Lat. 0.52; Diam. 0.28 inches.
" 20; " 13; " 7 mill.

Hab. The West Indies, in the Island of New Providence. (Cabinets of the Smithsonian Institution, Cooper, Browne and Prime.)

The external appearance of this species presents all the character of a marine shell, its denticulation, however, places it without a question in the genus *Cyrena*. Mr. W. Cooper, of Hoboken, its discoverer, found several specimens of it in a brackish pond, living in company with some *Cerithia*. It is smaller, more fragile, less inflated and more regular in outline than either *C. floridana, C. salmacida* or *C. cubensis*.

34. Cyrena anomala, Deshayes.—Shell trigonal, very much inflated, heart-shaped, very inequilateral, striæ very fine, regular, hardly perceptible; epidermis light grayish green; beaks large, acute, inclined inwards; anterior side short, broadly semi-circular; posterior side extended, conical, acute and angular at extremity; valves very fragile, interior grayish with markings of violet; hinge-margin rounded, very narrow; cardinal teeth very small, approximate, subequal, divergent, the central tooth bifid; lateral teeth subequal, distant, compressed; sinus very small, barely visible.

Fig. 24.

C. anomala.

Long. 2.00; Lat. 1.60; Diam. 1.36 inches.
" 50; " 40; " 34 mill.

Hab. South America, in Peru. (Cabinets of Cuming and Prime.)

Cyrena anomala, Desh. Proc. Zool. XXII, 1854, 21.
Cyrena peruviana, Desh. Bivalv. Brit. Mus. 1854, 257.

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A very rare species, the only specimens I have seen being the one in Mr. Cuming's cabinet and a young one in my own, which was received from him. It is easily distinguished from all others by the peculiar outline of the posterior side which terminates in a very acute angle. The shell marked *C. peruviana* in Mr. Cuming's collection, from which Mr. Deshayes described it, belongs without doubt to the species above.

Fossil Species.

35. Cyrena densata, Conrad.—"Shell subtriangular, thick, convex; anterior margin obtusely rounded; basal margin profoundly and regularly curved to the posterior extremity, which is subtruncated, direct, and greatly above the line of the base; beaks central, summits elevated; striæ robust; teeth large, robust, very prominent; middle tooth of the right valve bifid; lateral teeth elongated, robust, anterior tooth truncated, suddenly deflected at the extremity, posterior tooth distant."

Long. 1.87; Lat. 1.80 inches.

Hab. North America, at Petersburg, in the State of Virginia. Tertiary formation. (Cabinet of ?.)

Cyrena densata, Conrad, Proc. Ac. N. S. Phil. 1, 1845, 324.

36. Cyrena dakotensis, Meek and Hayden.—"Shell suborbicular, or broad ovate-subtrigonal, moderately convex; anterior and posterior sides rather abruptly rounded; base forming a semi-oval curve; dorsal outline sloping from the beaks, the anterior slope being a little concave, and the posterior convex in outline; beaks rather elevated and subcentral; anterior muscular impression narrow, ovate, well defined; posterior broader and more shallow: palleal line distinct, nearly simple, or very faintly sinuous just beneath the posterior muscular scar; surface marked by more or less distinct concentric striæ."

Long. 1.20; Lat. 1; Diam. 0.58 inches.

Hab. North America, at the mouth of the Big Sioux or Dakotah River. Dakotah group of the Nebraska and Dakotah cretaceous series. (Cabinet of the Smithsonian Institution.)

Cyprina arenaria, Meek & Hayden, Proc. Ac. N. S. Phil. 1857, 143.

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SPHÆRIUM, Scopoli.[1]

Pectunculus, Lister, 1685.—*Musculus*, Gualt. 1742.—*Tellina*, Linn. 1758.—*Sphærium*, Scop. 1777.—*Cardium*, Da Costa, 1778.—*Cyclas*, Brug. 1792.—*Nux*, Humphr. 1797.—*Musculium*, Link, 1807.—*Cornea*, *Pisum*, Megerle, 1811.—*Corneocyclas*, Fer. 1818.—*Amesoda*, Rafin. 1820.—*Pisidium*, Verany, 1846.—*Cycladites*, Krug. 1848.

Animal oval, lobes of the mantle simple, united posteriorly, and terminating in two short syphons, joined at their base, without tentacles; mouth oval-shaped, small; tentacles of the mouth short and narrow; gills rather broad, nearly equal, united behind the foot; foot narrow, elongated.

Shell oval, nearly equilateral; beaks somewhat inflated and prominent; hinge-margin narrow, with two primary teeth in each valve; lateral teeth elongated; palleal impression simple; ligament external, narrow, situated on the longer portion of the shell.

The genus *Sphærium* was characterized under its present name by Scopoli, in 1777; since that time, however, it has received various denominations, and the one under which it has been most generally known, that of *Cyclas*, was applied to it in 1792 by Bruguière. Mr. Gray revived the term of *Sphærium* in 1847, and his example has been followed by the conchologists of the continent of Europe. I was the first in this country to discard the name of *Cyclas* for that of *Sphærium*.

The species composing this genus are small bivalves inhabiting rivers, lakes, streams, and still waters; they are plentifully distributed all over the globe, but as far as present experience goes, seem to be more abundant on the northern portion of this hemisphere than elsewhere.

The shell is transversely oval, nearly equilateral, thin, fragile, sometimes translucent, with beaks more or less raised; its entire surface is transversely striated and covered with a light epidermis varying in color; the margins are rounded, obtuse or angular. The interior of the valves is smooth and varies in color; the muscular impressions are not very distinct; the posterior one is slightly

[1] Introduct. ad. Hist. Nat. 1777, 397.

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the largest; the palleal impression is parallel with the basal margin; it is narrow and always simple. The hinge-margin is very variable; it is usually composed of two small teeth in each valve; at times, however, they are single in one and double in the other, or else single in both valves; these teeth are occasionally rudimentary, or even nearly obsolete. The lateral teeth placed on each side of the cardinal teeth are double in the right valve and single in the left one; the anterior lateral tooth is usually the shorter. The ligament is external; it is short, not very conspicuous, and is always found on the longer portion of the shell.

The animal of *Sphærium* has a broad foot, capable of considerable extension; it uses it either to bore holes in the mud, in which it sinks the posterior portion of the shell, or as means of locomotion. The syphonal tube is double and very retractile; it is often white like the foot, but at times it is colored.

The habits of these molluscs are very similar to those of *Pisidium*, with which they are often found living. The species of *Sphærium* are less abundant in individuals than those of *Pisidium;* they are also less generally distributed, and are more confined to certain localities than the latter.

a. BEAKS ROUNDED, NEVER TUBERCULAR.

1. Sphærium sulcatum, LAMARCK. — Animal white, tubes a light orange color.

Fig. 25.

Sph. sulcatum.

Shell transversely oval, nearly equilateral, light in texture for its size; posterior margin somewhat more pointed; anterior rounded, base slightly curved; valves convex; beaks full, raised above the outline of the shell; posterior portion a little longer; sulcations coarse, regular; epidermis dark chestnut-brown; interior light blue; hinge-margin narrow, nearly a straight line; cardinal teeth small, indistinct, situated somewhat towards the anterior side, double in both valves, and so placed as to assume the shape of the letter V reversed; lateral teeth on a line with the primary teeth, large, strong and prominent.

The young is more equilateral than the adult; more compressed; it presents the shape of a quadrilateral, it is of a light lemon color, the striations are as heavy as those of the mature shell.

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Long. 0.68; Lat. 0.43; Diam. 0.31 inches.

Hab. North America, in the New England States, in the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, Wisconsin, Iowa, Minnesota and Alabama, and in Canada. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Garden of Plants in Paris, Museum Delessert, Jay, Prime and others.)

Cyclas sulcata, LAMARCK, An. s. vert. V, 1818, 560.
Cyclas saratogea, LAMARCK, loc. sub. cit. V, 1818, 560.
Cyclas similis, SAY, Nich. Encycl. Amer. edit. IX, 1818, pl. 1, f. 9.
Cyclas lasmampsis, RAFINESQUE, Il. scie. Phys. IX, 1820, 319, pl. 82, f. 19, 20.
Cyclas solida, DEKAY, Rept. 1842, 220, pl. XXV, f. 265.
Cyclas gigantea, PRIME, Bost. Proc. IV, 1851, 157.
Cyclas ponderosa, PRIME, loc. sub. cit. IV, 1851, 157.
Cyclas striatina, LAMARCK, Fer. in Mag. Zool. 1835.
Cyclas rhomboidea, SAY, C. B. ADAMS, Vermont cat. 1842, 18.

This, our most common and widely distributed species, living as it does in so many different sections of the country, presents at times great variations in size, color and general appearance. It can, however, be easily recognized by its very elongated and equilateral form, and by the beaks which are uniformly full and convex; they are often eroded. The young is often of an uniform light lemon color, which, as the shell matures, becomes gradually darker from the beaks downwards until the new shade covers the whole surface of the shell; in certain intermediate stages of growth, the shell is marked with a zone of yellow on the inferior margin; the color of the adult varies from a greenish-brown to a dark chestnut. The young shell has at times, owing to the variations which exist between it and the adult, been taken for a different species; by some it has been taken for the *S. rhomboideum*.

The hinge-margin is generally straight. I have specimens, however, from Alabama, Pennsylvania and Rhode Island, in which it is slightly curved. One of the distinctive characters of this species is that the lateral teeth are never placed at an angle with the cardinal teeth; they are generally on a straight line with them.

The finest specimens I have seen of the *S. sulcatum* were sent to me by Mr. Ingalls, who had collected them in Washington County, New York; they were remarkably convex, and measured as much in length as $\frac{1}{16}$ of an inch; the beaks were very full, and much raised above the margin of the shell.

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This species was first described in 1818, by Lamarck, under the names of *C. sulcata* and *C. saratogea*. Say, in 1819, ignorant that this shell was known to conchologists, described it as the *C. similis*, under which name, until very recently, it has been most generally known. Say also figured this species, but his figure, I regret to say, is not correct, and would be more apt to give one the idea of a *Pisidium* than of a *Sphærium*. The description by Say of the *C. similis* applies perfectly to the shell under consideration, of which Dr. Gould has given a very good figure in his Report on the Invertebrata of Massachusetts.

As related elsewhere,[1] I had an opportunity, some years since, while in Paris, to see Lamarck's original specimens of the *C. sulcata* and *saratogea*, at the Garden of Plants, and at the Delessert Museum; and to convince myself by examination that they both belonged to one species, and were identical with Say's *C. similis*.

2. Sphærium aureum, PRIME.—Animal not observed.

Shell transversely oval, slightly elongated, nearly equilateral, heavy, convex; beaks full, raised above the outline of the shell; anterior margin broad and rounded; posterior narrower and somewhat angular; inferior slightly curved; hinge-margin somewhat broad, curved; cardinal teeth diminutive, double, so placed together as to represent the form of the letter V reversed, and rather wide-spread; lateral teeth situated each one at an angle with the cardinal teeth, strong and large; sulcations deep, not very regular; epidermis varying from a greenish-yellow to a bright gold color, slightly lustrous; interior of the valves bluish-white.

Fig. 26.

S. aureum.

Long. 0.56; Lat. 0.43; Diam. 0.37 inches.

Hab. North America, from Lake Superior? (Cabinets of Agassiz, Smithsonian Institution and Prime.)

Cyclas aurea, PRIME, Bost. Proc. IV, 1851, 159.

This is one of our most attractive species, but also one of the rarest. It is supposed to have been brought from Lake Superior by the expedition which visited that region under Professor Agassiz. In general outline it offers some similarities with the *S. sulcatum;* it is, however, a much more ponderous shell; it is less elongated, more convex, its sulcations are not so regular, its

[1] Notes on some American species of *Cyclas*, &c., by Temple Prime, the Hague, 1857. 8vo.

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color is different, and lastly, its hinge-margin is much more curved.

Compared with *S. solidulum*, it is more convex, more elongated, its posterior margin is broader, the hinge-margin is not so much curved, the beaks are fuller, and the sulcations are not quite so heavy; the color is also different.

3. Sphærium solidulum, PRIME.—Animal not observed.

Shell transversely inequilateral, elongated, slightly convex; beaks full, not very prominent; anterior margin rounded; posterior drawn out to an angle; base slightly curved; epidermis variable, dark chestnut or brownish-yellow, with sometimes a yellow zone on the basal margin; sulcations coarse, irregular; interior dark blue; hinge-margin considerably curved; cardinal teeth double, in the shape of the letter V reversed; lateral teeth large; the anterior placed at an angle with the margin; the posterior more on a continuation of the curve.

Fig. 27.

S. solidulum.

Long. 0.56; Lat. 0.43; Diam. 0.31 inches.

Hab. North America, in the States of New York, New Jersey, Ohio, Maryland, Virginia, Indiana and Wisconsin. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Jay and Prime.)

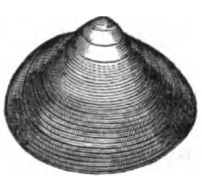
Cyclas solidula, PRIME, Bost. Proc. IV. 1851, 158.
Cyclas distorta, PRIME, loc. sub. cit. IV, 1851, 158.

This species, which is not uncommon, was probably confounded by our early conchologists with *S. sulcatum;* it differs from that species, however, in being less elongated, more inequilateral, less convex, the hinge-margin is more curved, and the shell is more solid.

4. Sphærium triangulare, SAY.—Animal not observed.

Shell transversely oval, nearly equilateral, rather full, anterior margin slightly distended, rounded, posterior somewhat abrupt, basal rounded; beaks large, full, prominent; lines of growth regular, epidermis brownish; hinge-margin narrow, curved; cardinal teeth very distinct, assuming the shape of the letter V reversed; lateral teeth prominent.

Fig. 28.



S. triangulare.

Long. 0.56; Lat. 0.43; Diam. 0.25 inches.

Hab. North America, in Mexico. (Cabinet of the Academy of Natural Sciences of Philadelphia.)

Cyclas triangularis, SAY, New Harm. Dissem. 1829, 356.

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The specimens from which I have prepared this description were presented to the Academy of Natural Sciences of Philadelphia by Mrs. Say, as the *C. triangularis*, Say; they may or may not be true representatives of Say's species. In many points they answer his description of the *C. triangularis*, but at the same time I am not able to reconcile their shape, which is not more triangular than that of any other species, with the name he has applied to the species. Moreover, they bear a very strong resemblance to one of our Northern *Sphærium*, the *S. solidulum;* they differ from it, however, in being less heavily and more regularly striated, and in having more prominent beaks.

5. Sphærium striatinum, LAMARCK.— Animal white, tubes light reddish yellow.

Fig. 29.

S. striatinum.

Shell slight, transversely elongated, somewhat compressed, inequilateral; anterior margin rounded, posterior distended, inferior rounded; beaks full, not much raised; sulcations irregular, at times so light as hardly to be seen with the naked eye, thus giving the shell a lustrous appearance; color varying from a light greenish-yellow to a darker shade; valves slight; interior blue; hinge-margin slightly curved; cardinal teeth double, very small, of the same size; lateral teeth larger, not very prominent.

Long. 0.43; Lat. 0.31; Diam. 0.25 inches.

Hab. North America, in the States of New York, Connecticut, New Jersey, Pennsylvania, Michigan, Illinois, Ohio, Wisconsin, Alabama, Tennessee, Iowa, in the Hell Gate River, Washington Territory, and in Canada. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Jay, Prime, and others.)

Cyclas striatina, LAMARCK, An. s. vert. V, 1818, 560.
Cyclas edentula, SAY, N. Harm. Dissem. 1829, 2.
Cyclas cornea, LAMARCK, C. B. Adam's Cat. 1847.
Cyclas albula, PRIME, Bost. Proc. IV, 1851, 155.
Cyclas tenuistriata, PRIME, loc. sub. cit. IV, 1851, 156.
Cyclas acuminata, PRIME, loc. sub. cit. IV, 1851, 158.
Cyclas inornata, PRIME, loc. sub. cit. IV, 1851, 159.
Cyclas simplex, PRIME, loc. sub. cit. IV, 1851, 159.
Cyclas modesta, PRIME, loc. sub. cit. IV, 1851, 159.

As may be seen by the above synonymy, I have been induced to unite under this species several which I described as distinct in

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1851. The differences existing between these shells are at times quite marked, but in general characters they agree, and I am inclined to believe that these differences owe their origin solely to local causes.

I had occasion some time since to convince myself of the identity of the *S. striatinum* with the *C. edentula* of Say.[1]

This species, which is not unplentiful in the localities where it is found, varies much in size, color, and external appearance generally. The shell from Connecticut is so slight, that it is nearly translucent, and the striæ are so light as to impart to it a lustrous appearance; on the other hand, I have specimens from the Hoosack, which are quite heavy and coarsely striated; in the main, however, they all seem to tally. The variety from Alabama, described as the *C. tenuistriata*, is less distended, is fuller, and the sulcations are hardly perceptible.

Compared with *S. solidulum*, this species is smaller, more inequilateral, less tumid, more compressed, less solid, less heavily sulcated, and its posterior extremity is more distended.

6. Sphærium stamineum, Conrad.—Animal not observed.

Fig. 30.

S. stamineum.

Shell oval, somewhat full, inequilateral; anterior generally abrupt; posterior slightly distended; beaks very full and prominent, widely separate at the apex, often eroded; epidermis dark brownish-yellow; striæ heavy; valves strong; interior blue; hinge-margin curved; cardinal teeth double, nearly obsolete; lateral teeth distinct, strong.

Long. 0.56; Lat. 0.37; Diam. 0.31 inches.

Hab. North America, in the States of New Jersey, Ohio, Illinois, Arkansas and Alabama. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Conrad, Jay and Prime.)

Cyclas staminea, Conrad, Amer. Journ. XXV, 1834, 342, pl. 1, f. v.
Cyclas fuscata, Rafinesque, Prime in Bost. Proc. IV, 1852, 281.
Cyclas bulbosa, Anthony, Prime in loc. sub. cit. IV, 1852, 283.

I have been induced to unite to this species the *C. fuscata*, Rafinesque, which I consider as nothing more than a large variety.

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[1] Notes on some American species of *Cyclas*, &c., by Temple Prime, the Hague, 1857. 8vo.

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The *C. bulbosa*, Anthony, is a little more globose than Mr. Conrad's typical specimens, but presents no important characters of difference. The shells of this species found in New Jersey and in Illinois, are larger than those from Alabama.

This species differs from most of our North American ones by its full and very prominent beaks.

7. Sphærium rhomboideum, SAY.—Animal, syphons reddish-yellow.

Shell subglobular, rhombic-orbicular, equilateral; anterior margin truncated; posterior slightly angular; basal nearly straight; beaks full, but not prominent; valves slight, convex towards the beaks, gradually decreasing in fulness towards the margins; interior blue; sulcations very delicate; epidermis olive-green, with often a straw-colored zone on the margins; young shell more compressed than the adult; hinge-margin nearly straight; cardinal teeth rudimentary; lateral teeth distinct, somewhat acute, not elongated.

Fig. 31.

S. rhomboideum.

Long. 0.50; Lat. 0.37; Diam. 0.31 inches.

Hab. North America, in the States of Vermont, Connecticut, Massachusetts, New York, Ohio, Michigan, and in Canada. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Jay, Prime, and others.)

Cyclas rhomboidea, SAY, Acad. Nat. Sci. Phil. II II, 1822, 380.
Cyclas cornea, var. 3, LAMARCK, An. s. vert. V, 1818, 558.
Cyclas elegans, C. B. ADAMS, Bost. Jour. III, 1840, 330, pl. 3, f. 11.

This, the most attractive species of *Sphærium*, is not easily confounded with any other. Up to within a few years it was usually known among collectors under the name of *C elegans*, Adams. I have stated elsewhere[1] my reasons for considering the *C. elegans* as identical with Say's shell. Though no longer rare since 1851, when Mr. Whittemore found it in considerable abundance at one place near Cambridge, Mass., this species does not seem to be very widely distributed; it is confined to certain special localities.

[1] Annals of the N. Y. Lyceum, vol. vi, 1853, 66.

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8. Sphærium dentatum, HALDEMAN.—Animal not observed.

Fig. 32.

S. dentatum.

Shell large, ventricose, somewhat equilateral, inferior and anterior margins rounded; posterior somewhat angular; beaks large, well-rounded, distant, not very prominent; hinge-margin nearly straight; cardinal teeth single, distinct; lateral teeth not prominent; sulcations slight; epidermis olive-green, with a dark narrow zone at some distance above the basal margin.

Long. 0.50; Lat. 0.40; Diam. 0.37 inches.

Hab. North America, in Oregon. (Cabinet of the Academy of Natural Sciences of Philadelphia.)

Cyclas dentata, HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1841, 100.

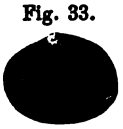
The young shell is more elongated and more heavily sulcated than the adult; the beaks are less large and less tumid. This is a well marked species, compared with *S. patella,* Gould, from the same section of the country, it is found to be larger, more ventricose, the beaks are more inflated, and the color of the epidermis is different.

The only two specimens I have seen of the *S. dentatum* were those from which Mr. Haldeman described the species, an adult and a young one, which he was kind enough to lend me for study; they are now deposited in the collection of the Academy of Natural Sciences of Philadelphia.

9. Sphærium fabalis, PRIME.—Animal, syphons crimson.

Shell transversely oval, compressed, nearly equilateral; anterior and basal margins rounded; posterior margin slightly abrupt; beaks not full, very much depressed; sulcations moderately heavy, very regular, quite distinct; epidermis light-green, it is, however, sometimes quite dark; in the young it is often straw color; valves slight, interior blue; hinge-margin very slightly curved; cardinal teeth small, assuming the shape of the letter V reversed; lateral teeth slight; anterior tooth somewhat more elevated, both placed very nearly on a line with the cardinal teeth.

Fig. 33.



S. fabalis.

Long. 0.56; Lat. 0.43; Diam. 0.25 inches.

Hab. North America, in the States of New York, Ohio, Illinois, Tennessee, Georgia, Virginia, Michigan and Pennsylvania. (Cabinets of Smithsonian Institution, Jay and Prime.)

Cyclas fabalis, PRIME, Bost. Proc. IV, 1851, 159.
Cyclas castanea, PRIME, loc. sub. cit. IV, 1851, 160.
Cyclas sulculosa, DECHARPENTIER, MSS. 1851.

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This is a very distinct species; I know of no other to which it bears any resemblance; it is remarkable for its compressed appearance, and for the depression of its beaks. Though pretty widely distributed, it does not seem to be found anywhere in much abundance.

The epidermis of the shell is at times so entirely stained with a darkish substance, that it is with difficulty that its color can be detected.

10. Sphærium occidentale, PRIME.—Animal not observed.

Shell oval, small, pellucid, fragile, equilateral, margins rounded; valves slight, rather convex; beaks full, rounded, not much raised; sulcations very fine, hardly visible; epidermis horn color; cardinal teeth very diminutive; lateral teeth more distinct.

Fig. 34.

S. occidentale.

Long. 0.31; Lat. 0.25; Diam. 0.18 inches.

Hab. North America, in the States of New York, Vermont, Ohio, Michigan, Wisconsin, in the Hell Gate River, Washington Territory, and in Canada. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Jay and Prime.)

Cyclas ovalis (preoc.), PRIME, Bost. Proc. IV, 1852, 276.
Sphærium ovale, STIMPSON, ADAMS, rec. gen. II, 1858, 450.
Sphærium occidentale, PRIME, Proc. Ac. N. S. Phila. 1860, 295.

This species is remarkable for its completely oval shape, which renders it quite distinct from all others. It is found not uncommonly. Compared with *S. partumeium*, under which name it has at times been sent to me, it is much smaller, the margins are more rounded, and the beaks are not so much raised.

11. Sphærium nobile, GOULD.—Animal not observed.

Shell rhombic-ovate, inequilateral, moderately compressed; anterior margin truncated, posterior more distended, basal curved; beaks rounded, inclined towards the front, slightly tr.mid, separate at apex; sulcations coarse; epidermis delicate, light brown; valves strong, interior white; hinge-margin nearly straight, moderately broad; cardinal teeth single, distinct; lateral teeth moderately developed.

Fig. 35.

S. nobile.

Long. 0.50; Lat. 0.37; Diam. 0.25 inches.

Hab. North America, at San Pedro, in the State of California. (Cabinets of Gould, Smithsonian Institution and Prime.)

Cyclas nobilis, GOULD, Bost. Proc. V, 1855, 229. Atlas of U. S. Exp. Expedit. pl. 36.

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Compared with *S. sulcatum* it is slighter, less sulcated, more compressed and less tumid. This species is rare, the only specimens I have seen were kindly presented to me by Dr. Gould.

12. Sphærium patella, GOULD.—Animal not observed.

Shell rounded oval, lenticular, compressed, equilateral; margins generally rounded; beaks central, small, hardly raised; valves slight, interior white; sulcations extremely fine; epidermis light, of a yellowish-brown color; cardinal teeth very diminutive, so placed as to assume the shape of the letter V reversed; lateral teeth not prominent, elongated.

Fig. 36.

S. patella.

Long. 0.43; Lat. 0.31; Diam. 0.18 inches.

Hab. North America, in Oregon. (Cabinets of Gould, Smithsonian Institution and Prime.)

Cyclas patella, GOULD, Bost. Proc. III, 1850, 292. Atlas U. S. Exp. Expedit. pl. 36.

This species is peculiar, owing to its compressed oval shape and rounded beaks; compared with *S. flavum* it is more oval, more equilateral, and its beaks are less tumid. The specimens in my cabinet came from Dr. Gould.

13. Sphærium vermontanum, PRIME.—Animal not observed.

Shell very oblique, tumid, inequilateral, full; anterior margin abrupt, posterior drawn out to an angle, basal slightly curved; beaks large, full, prominent, placed very much towards the anterior, in which direction they are slightly inclined; sulcations coarse, moderately regular; epidermis light green; ligament conspicuous; valves solid, interior light blue; hinge-margin much curved, broad; cardinal teeth strong, representing the letter V reversed; lateral teeth elongated, strong.

Fig. 37.

S. vermontanum.

Long. 0.56; Lat. 0.37; Diam. 0.25 inches.

Hab. North America, in Lakes Champlain and Memphremagog, Vermont. (Cabinets of Prime and Smithsonian Institution.)

Sphærium vermontanum, PRIME, Proc. Ac. N. S. Phil. 1861, 128.

Remarkable for its very oblique and tumid shape, and for the abruptness of its anterior margin. Compared with *S. stamineum*, it is more tumid and less heavily sulcated; it is less elongated and more tumid than the *S. striatinum*. Quite rare. I have never seen but a few specimens of this species, which were received from the late Prof. Adams, of Amherst.

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14. Sphærium emarginatum, PRIME.—Animal not observed.

Shell triangular, nearly equilateral, convex, tumid, anterior and posterior margins abrupt, posterior slightly more distended, basal margin curved; valves solid, interior white; beaks very full, prominent, nearly central; ligament distinct; sulcations regular, not heavy; epidermis brown, with several narrow transverse zones of a dark color at regular intervals; hinge-margin curved; cardinal teeth single, quite distinct; lateral teeth not much elongated, strong.

Fig. 38.

S. emarginatum.

Long. 0.37; Lat. 0.37; Diam. 0.25 inches.

Hab. North America, in the region of Lake Superior. (Cabinets of Agassiz, Smithsonian Institution and Prime.)

Cyclas emarginata, PRIME, Bost. Proc. IV, 1851, 156.

The triangular and very tumid form of this species is quite singular; it differs from *S. vermontanum* in being more tumid, fuller, in having larger beaks, and in being much less broad at the base. The young shell is more elongated and less tumid than the adult. A rare species.

15. Sphærium flavum, PRIME.—Animal not observed.

Shell transversely rounded, compressed, equilateral, delicate, margins generally rounded, the posterior a little distended; beaks central, not full, more or less depressed; valves very slight, interior whitish; sulcations pretty deep, regular; epidermis light, of a greenish-yellow color; cardinal teeth small, in the shape of the letter V reversed; lateral teeth elongated.

Fig. 39.

S. flavum.

Long. 0.43; Lat. 0.31; Diam. 0.18 inches.

Hab. North America, at the Sault St. Marie, Lake Superior. (Cabinets of Agassiz, Smithsonian Institution, Jay and Prime.)

Cyclas flava, PRIME, Bost. Proc. IV, 1851, 155.

This is a very slight and delicate species, quite distinct from any others but *S. patella,* to which it bears some general resemblance from its shape; it is, however, more compressed, less high, and the exterior of the valves is very different, as they are nearly smooth in Dr. Gould's shell. Found not unplentifully in the one locality.

16. Sphærium tumidum, W. BAIRD.—S. testa ovato-trigona, tumida, olivacea, conferte transversim concentrice forte costata; umbonibus prominentibus, nec non erosis; interne cœrulescente; margine ventrali rotundato.

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Long. 0.50; Lat. 0.51 inches.

Hab. North America, at Sumass Prairie, Frazer River, British Columbia. (Cabinet of the British Museum.)

Sphærium tumidum, W. BAIRD, Proc. Zool. 1863, 69.

"This shell is of a tumid, swollen figure, and of an ovate-trigonal shape. The color externally is dark olive, and it is strongly ribbed concentrically. The beaks are prominent, and frequently eroded. The inner surface is of a bluish tint. The ventral or lower margin is rounded."

17. Sphærium spokani, W. BAIRD.—S. testa rotundato-ovata, cornea, concentrice transversim conferte minute striata, nitida, sub lente obsolete punctata; umbonibus rotundatis, obtusis; interne albida; margine ventrali rotundato.

Long. 0.48; Lat. 0.51 inches.

Hab. North America, in the Spokane and Kootanie Rivers, British Columbia. (Cabinet of the British Museum.)

Sphærium spokani, W. BAIRD, Proc. Zool. 1863, 69.

This shell is smaller than *S. tumidum*, more rounded, and with more obtuse beaks. The striæ or riblets are much less distinct; the color is pale horny externally, and white internally. It has a shining appearance; but when examined by the lens, the surface is seen to be indistinctly punctate. The specimens taken from the Spokane River are much larger than those collected in the Kootaine.

b. BEAKS TUBERCULAR OR CALYCULATE.

18. Sphærium elevatum, HALDEMAN.—Animal not observed.

Fig. 40.

S. elevatum.

Shell ovate, orbicular, nearly spherical, cavity large, equilateral, margins well rounded; beaks central, slightly inclined towards the anterior, lapping over the outline of the shell, large, tumid, approximate, calyculate, prominent; hinge-margin slightly curved; cardinal teeth united, prominent; lateral ones elongated, large; valves very strong, interior bluish; surface smooth, striation light, irregular; color brownish-olive, greatly varied by zones of a lighter shade, a zone of bright yellow bordering the inferior and part of the lateral margins.

Long. 0.56; Lat. 0.50; Diam. 0.31 inches.

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Hab. North America, at New Orleans, La., and in Florida and Alabama. (Cabinets of the Academy of Natural Sciences of Philadelphia and Prime.)

Cyclas elevata, HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1841, 53.
Cyclas pallida, DECHARPENTIER, MSS. 1851.

Remarkable for its transversely spherical shape, which renders it distinct from all other species of this genus. It is much more solid than the generality of calyculate species, the valves being as strong as those of any of the larger species of the preceding group.

C. pallida, the young of this species, is more delicate than the adult; it is a little less transversely spherical, the striæ are lighter, and the color is bright yellow.

Prof. Haldeman's original specimen of *C. elevata*, from which this description was prepared, and which is now in the cabinet of the Academy of Natural Sciences, though very perfect in appearance, comprised but a single valve.

This species seems to be very rare. I have never met with any other specimens but the one in the cabinet of the Academy and those I have in mine—two specimens of *C. pallida*, derived from DeCharpentier himself, and a single valve from Florida.

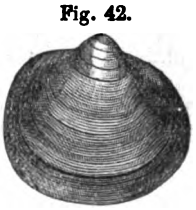
Fig. 41.

S. elevatum.

19. Sphærium partumeium, SAY.—Animal usually white, in some varieties pink, syphonal tubes pink.

Shell rounded-oval, thin, fragile, pellucid, somewhat inflated, nearly equilateral; anterior margin very slightly distended, rounded; posterior slightly abrupt; basal rounded; beaks central, calyculate, approximate at apex; striæ so delicate as hardly to be visible; epidermis glossy, of a light greenish horn color, with at times a zone of a different shade on the basal margin; valves delicate, moderately convex, interior light blue; hinge-margin nearly straight, passing by a regular curve into the anterior margin, but curving suddenly behind so as to form an obtuse angle, causing the posterior side to appear broader, thus giving the shell

Fig. 42.



S. partumeium.

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a somewhat rhombiform appearance; cardinal teeth strong, assuming the shape of the letter V reversed; lateral teeth very much elongated.

The young shell is more compressed than the adult; it is usually light yellow.

Long. 0.50; Lat. 0.43; Diam. 0.31 inches.

Hab. North America, in the States of New England, New York, New Jersey, Wisconsin, Pennsylvania, Ohio, Michigan, South Carolina, Georgia, Mississippi, Alabama, and Arkansas. (Cabinets of the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Boston Society of Natural History, Garden of Plants at Paris, Agassiz, Jay and Prime.)

Cyclas partumeia, Say, Acad. Nat. Sci. Phila. Jour. II, 1822, 380.
Cyclas cornea, var. 2, Lamarck, An. s. Vert. V, 1818, 558.
Cyclas orbicularia, Barratt, American Jl. XLVIII, 1845, 276.
Cyclas mirabilis, Prime, Bost. Proc. IV, 1851, 157.
Cyclas cærulea, Prime, loc. sub. cit. IV, 1851, 161.
Cyclas eburnea, Anthony, loc. sub. cit., IV, 1852, 279.

This species varies much according to the localities where it is found, which accounts in part for the number of names it has received. *C. orbicularia*, of which I have authentic specimens from Mr. Barrat, is a genuine *S. partumeium*, without even any local modifications of shape. *C. mirabilis*, from Georgia, is a small form of this species, and *C. cærulea* differs from the type in being a little less inflated. *C. eburnea*, from Arkansas, varies from the northern *S. partumeium* in being more compressed and a little more elevated. I do not think, however, taking the difference of localities into consideration, that these are characters sufficient to warrant retaining *C. eburnea* as a distinct species. I had an opportunity, while in Paris, to assure myself that the variety No. 2 of *C. cornea* was a true *S. partumeium*.

This species is not only very widely distributed, but where it is found, it occurs in large numbers. The only one of our northern species to which it bears much resemblance is *S. truncatum*, and that is only in general outline; the *S. partumeium* is much more inflated and transversely more broad.

20. Sphærium jayanum, Prime.—Animal not observed.

Shell rhombic, nearly equilateral, moderately convex, thin, fragile, somewhat translucent, drawn up to an angle towards the hinge-margin; anterior and posterior margins very abrupt, inferior very slightly curved: beaks central, calyculate, approximate at apex; hinge-margin considerably shorter than the basal margin, slightly curved; cardinal teeth

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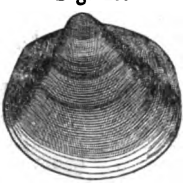
distinct, in the shape of the letter V reversed; lateral teeth elongated; valves delicate, interior light blue; striæ hardly visible; epidermis glossy, light greenish horn color, with at times a zone of bright yellow on the inferior margin.

Fig. 43.



S. jayanum.

Long. 0.50; Lat. 0.43; Diam. 0.18 inches.

Hab. North America, in the region of Lake Superior? Iowa and Canada. (Cabinets of Agassiz, Smithsonian Institution, Jay, Garden of Plants in Paris, and Prime.)

Cyclas jayensis, PRIME, Bost. Proc. IV, 1851, 157.

This attractive and rare species is easily distinguished by its elevated shape and by its abrupt lateral margins, which give it a somewhat triangular appearance. It is related to *S. ryckholti* of Europe, from which it differs, however, in being more inflated, its beaks are less prominent, the shell is more elevated, and its anterior margin is abrupt, whereas in *S. ryckholti* it is distended and angular.

21. Sphærium tenue, PRIME.—Animal not observed.

Shell small, transversely oblong, pellucid, moderately full, subequilateral; anterior and basal margins rounded, posterior margin subabrupt; beaks nearly central, not prominent, calyculate; striations very fine and regular, hardly perceptible; epidermis glossy, light straw color; valves slight, interior straw color; hinge-margin short, narrow, nearly straight; cardinal teeth very diminutive, lateral teeth small, elongated.

Fig. 44.

S. tenue.

Long. 0.18; Lat. 0.12; Diam. 0.06 inches.

Hab. North America, in the Androscoggin, Maine, and in the Upper Mackenzie, British America. (Cabinets of Prime and the Smithsonian Institution.)

Cyclas tenuis, PRIME, Bost. Proc. IV, 1851, 161.

This species, the smallest one known to inhabit the United States, was discovered some years since by Mr. Girard, from whom I obtained my specimens. It may possibly be the young of some species, but if so, it would be very difficult to say which; setting aside its diminutive size, it appears to have all the characteristics of a mature shell. In outline it seems to be allied to *S. transversum;* it is, however, more inflated, less elongated, and its margins are more rounded. At first sight, it might readily be mistaken for a *Pisidium.*

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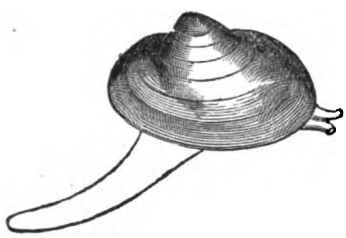
22. Sphærium transversum, Say.—Animal white, syphonal tubes pink, foot white.

Shell transversely oblong, elongated, subinequilateral, translucent; anterior side narrow; anterior margin rounded, posterior margin subtruncate, basal very much curved; beaks placed somewhat on the anterior side, large, calyculate, very much raised above the outline of the shell; striæ very delicate; epidermis greenish-yellow, of a darker shade at times on the region of beaks; valves slight, interior bluish; hinge-margin very nearly straight, narrow; cardinal teeth compressed, in the shape of the letter V reversed, and very much expanded; lateral teeth slightly elongated.

Fig. 45.



S. transversum.

Long. 0.62; Lat. 0.43; Diam. 0.25 inches.

Hab. North America, in the States of New York, Pennsylvania, Ohio, Kentucky, Arkansas, Alabama, and in Canada. (Cabinets of Jay, Prime and the Smithsonian Institution.)

Cyclas transversa, Say, New Harm. Dissem. II, 1829, 356.
Cyclas detruncata, Prime, Bost. Proc. IV, 1851, 155.
Cyclas gracile, Prime, loc. sub. cit. IV, 1851, 156.
Cyclas constricta, Anthony, loc. sub. cit. IV, 1852, 274.

This large and delicate species is remarkable for its very transverse shape and for the narrowness of the anterior extremity as compared to the posterior. The form of the shell recalls that of many of the small species from the West Indies and South America. It is found in considerable abundance.

C. detruncata does not differ sufficiently from the type to constitute even a variety. *C. gracilis* is a large variety of *S. transversum;* it is a little more inflated and of a darker color. *C. constricta* is nothing more than a difformed specimen of Say's species, having a perpendicular furrow up the centre of each valve, caused by some accident occurring to the shell during its growth.

23. Sphærium contractum, Prime.—Shell transversely oblong, inequilateral, translucent, moderately full; anterior side narrow; anterior margin rounded; posterior margin subtruncate; basal rounded: beaks inclined towards the anterior, calyculate, raised above the outline

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of the shell; striæ very delicate; epidermis greenish-yellow, somewhat darker in the region of the beaks; valves slight, interior bluish; hinge-margin somewhat rounded, narrow; cardinal teeth slight, assuming the shape of the letter V reversed; lateral teeth elongated.

Fig. 46.

S. contractum.

Long. 0.56; Lat. 0.34; Diam. 0.21 inches.

Hab. North America, in the Big Prairie Creek and in Greer's Creek in the State of Alabama. (Cabinets of the Smithsonian Institution, Lewis, Showalter, Wheatley, and Prime.)

Compared with *S. transversum*, to which this species is closely allied, it is found to be smaller, less elongated, the beaks are smaller, the anterior and posterior margins less disproportionate and the hinge-margin is more rounded.

Found by Dr. Showalter, in not inconsiderable number.

24. Sphærium securis, PRIME.—Animal pinkish, syphons of the same color.

Shell rhombic-orbicular, ventricose, subequilateral, both sides of very nearly the same length; anterior margin a little curved; posterior margin abrupt, forming an obtuse angle with the hinge-margin: basal margin much longer than the superior margin, rounded; beaks large, calyculate, slightly inclined towards the anterior, very approximate at apex; valves slight, very convex, especially in the region of the umbones; striæ delicate, regular, hardly perceptible; epidermis glossy in some cases, very variable in color, but generally of a greenish-horn, at times of a brilliant yellow or straw color; hinge-margin curved, narrow; cardinal teeth very small, united at base; lateral teeth slight, elongated, very narrow.

Fig. 47.

S. securis.

Long. 0.37; Lat. 0.31; Diam. 0.25 inches.

Hab. North America, in the States of Massachusetts, Vermont, Rhode Island, Pennsylvania, Michigan, New York, and in Canada. (Cabinets of Jay, Lewis, Prime, and Smithsonian Institution.)

Cyclas securis, PRIME, Bost. Proc. IV, 1851, 160.—Ann. N. Y. Lyceum, V, 1851, 218, pl. vi.

C. cardissa, PRIME, Bost. Proc. IV, 1851, 160.

C. crocea, LEWIS, loc. sub. cit. VI, 1854, 25.

Found plentifully at Cambridge, Mass. I cannot see differences sufficient between *S. securis* and *C. cardissa* to separate them; *C. cardissa* is more globose, transversely shorter, more elevated,

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but still intermediate forms uniting the two are so frequent that it is not possible that they should form distinct species.

C. crocea, Lewis, is a young of this species.

Compared with *S. sphæricum*, the *S. securis* is more equilateral, the beaks are less tumid and less inclined, the sides are less rounded, and the hinge-margin is less curved.

25. Sphærium rosaceum, Prime.—Animal not observed.

Shell small, rounded-oval, fragile, translucent, subequilateral, somewhat compressed, margins generally rounded; beaks nearly central, slightly inclined towards the anterior, calyculate, approximate at apex; valves very slight, a little convex in the region of the umbones; striæ regular, hardly visible; epidermis shiny, reddish-brown; hinge-margin nearly straight, delicate, narrow; cardinal teeth nearly obsolete, lateral teeth slight, elongated.

Fig. 48.

S. rosaceum.

Long. 0.25; Lat. 0.18; Diam. 0.15 inches.

Hab. North America, in the Schuylkill River. (Cabinet of Prime.)

Cyclas rosacea, Prime, Bost. Proc. IV, 1851, 155.

This species, which is very rare, the only specimens known to me being those in my collection, is not very liable to be confounded with others. Compared with *S. occidentale*, it is less full, the beaks are more prominent and are calyculate.

26. Sphærium sphæricum, Anthony.—Animal not observed.

Shell globose, subequilateral, transversely oval; anterior side narrow, distended, rounded; inferior margin rounded; posterior margin subabrupt; beaks inclined towards the anterior, large, prominent, calyculate; valves slight, very convex, interior blue; striæ fine and regular; epidermis greenish; hinge-margin much curved; cardinal teeth strong, united at base and disposed in the shape of the letter V reversed; lateral teeth prominent, very distinct, rather short.

Fig. 49.

S. sphæricum.

Long. 0.31; Lat. 0.20; Diam. 0.18 inches.

Hab. North America, in the Black River, Ohio. (Cabinets of Anthony, Prime, and Smithsonian Institution.)

Cyclas sphærica, Anthony, Bost. Proc. IV, 1852, 275.

Very rare; I have seen but few specimens of this species besides those in Mr. Anthony's collection and in mine. Compared with

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S. rosaceum, it is less equilateral, more inflated and the margins are less rounded.

27. Sphærium truncatum, Linsley.—Animal not observed.

Shell rhombic-orbicular, lenticular, thin, pellucid, very slightly inflated, subequilateral; anterior side narrower; anterior margin rounded; posterior margin nearly a straight line; basal somewhat curved; beaks central, calyculate, approximate at apex; striæ very delicate; epidermis glossy, light greenish horn color; valves slight, very little convex; interior light blue; hinge-margin very nearly straight; very narrow; cardinal teeth diminutive, united at base; lateral teeth slight, narrow, not much elongated.

Fig. 50.

S. truncatum.

Long. 0.37; Lat. 0.31; Diam. 0.15 inches.

Hab. North America, in the States of Maine, Vermont, Massachusetts, Connecticut, Wisconsin, New York, Ohio, and in Canada. (Cabinets of Linsley, Gould, Prime and Smithsonian Institution.)

Cyclas calyculata, C. B. Adams, Amer. Jour. XI, 1841, 277.
Cyclas truncata, Linsley, Amer. Jour. VI, 1848, 234, f. 3.
Cyclas pellucida, Prime, Bost. Proc. IV, 1852, 277.

The specimens from which this description was prepared, the same ones from which Dr. Gould described the original *C. truncata*, are precisely similar to those the late Prof. Adams sent to me labelled *C. calyculata*, from Vermont, and which I described, in 1852, under the name of *C. pellucida*. This species is undoubtedly very closely allied to *S. lacustre*, Férussac (*C. calyculata* of authors) of Europe, but still the differences are patent enough to authorize its being retained as distinct. Compared with *S. partumeium*, the *S. truncatum* is less inflated, transversely less broad, the posterior margin is more abrupt and the hinge slighter. The young, more tumid than the adult, is of a lemon yellow. Found not uncommonly.

28. Sphærium lenticula, Gould.—Animal not observed.

Shell rhombic-orbicular, lenticular, thin, pellucid, very slightly inflated, nearly equilateral; anterior side narrower; anterior margin curved; posterior margin abrupt, inferior rounded; beaks central, calyculate, approximate at apex; striæ hardly visible; epidermis glossy, light greenish horn color; valves delicate, a little convex towards the region of the umbones; interior light blue; hinge-margin nearly straight, narrow; cardinal teeth hardly visible, united at base; lateral teeth slight, narrow, not much elongated.

Fig. 51.

S. lenticula.

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Long. 0.43; Lat. 0.37; Diam. 0.18 inches.

Hab. North America, in Carson and Klamath Rivers, California. (Cabinets of Gould, Anthony and Prime.)

Lucina lenticula, Gould, Bost. Proc. III, 1850, 256.
Cyclas lenticula, Gould, Atlas Explor. Exped. pl. 36, f. 528.

This species, of which I obtained specimens from Dr. Gould, is so similar in nearly every respect to *S. truncatum*, that it is very difficult to tell them apart. The valves of *S. lenticula* are perhaps a little more convex as they approach the region of the beaks, and the hinge-margin a little more curved and less narrow. The young shell is of the same color as the adult, whereas, with *S. truncatum*, the young is of a lighter color.

29. Sphærium subtransversum, Prime.—Animal not observed.

Shell small, transversely oblong, equilateral, translucent, fragile, compressed; beaks central, large, calyculate; striæ very delicate; epidermis greenish-yellow.

Long. 0.30; Lat. 0.20; Diam. 0.10 inches.

Hab. North America, at Tabasco in Mexico. (Cabinet of Cuming.)

Sphærium subtransversum, Prime, Proc. Zool. XXVIII, 1860, 322.

The only specimen I have seen of this species was sent to me for description by Mr. Cuming.

30. Sphærium argentinum, D'Orbigny.—Animal not observed.

Shell oval, small, translucent, compressed; anterior side short, somewhat angular, posterior side distended and truncated at the end; beaks calyculate; striæ delicate; epidermis greenish-brown; valves slight, interior bluish; cardinal teeth united, lateral teeth hardly visible.

Long. 0.31; Lat. 0.25 inches.

Hab. South America, at Montevideo at the base of the Cerro. (Cabinet of the British Museum.)

Cyclas argentina, D'Orbigny, Mag. de Zool. 1835.—Ib. Voy. en Amer. Mérid. 1844, 568, pl. 83, f. 5–7.

It has not been my good fortune to meet with this species. M. D'Orbigny says it bears some resemblance to *C. calyculata*, meaning thereby, I presume, the shell now known to European Conchologists under the name of *S. lacustre*, Férussac.

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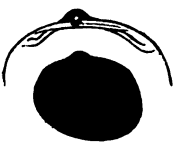
c. SHELL ALWAYS SMALL, RHOMBOIDAL, BEAKS CALYCULATE.

31. Sphærium bahiense, SPIX.—Animal not observed.

Shell very small, rounded-oval, inflated, inequilateral; anterior margin narrow, curved; posterior margin broad, subtruncate; inferior margin curved; beaks inclined towards the anterior, large, prominent, calyculate; valves slight, interior dark yellow, irregularly mottled with dark reddish spots; lines of growth very fine; epidermis yellowish-brown, with irregular spots of dark purple; hinge-margin very narrow, nearly straight; cardinal teeth small; lateral teeth comparatively strong, the posterior one much the longer.

Fig. 52.



S. bahiense.

Long. 0.15; Lat. 0.12; Diam. 0.09 inches.

Hab. South America, at Bahia in Brazil. (Cabinets of Jay, Prime and others.)

Cyclas bahiensis, SPIX, Test. Braz. 1827, 32, pl. XXV, f. 5, 6.
Cyclas maculata, ANTON (non MORELET), Wiegm. Archiv, 1837, 284.
Pisum maculatum, DESHAYES, Brit. Mus. Cat. 1854, 283.
Pisum bahiense, DESHAYES, loc. sub. cit. 1854, 284.
Musculium bahiense, ADAMS, Rec. Gen. II, 1858, 451.
Musculium maculatum, ADAMS, loc. sub. cit. II, 1858, 451.

This, the smallest species of *Sphærium*, has the peculiar appearance characteristic of the West Indian and South American shells of this genus. It does not seem to be uncommon. Some authors, led away by its diminutive size, have committed the error, as may be seen by the above synonymy, of placing it under the head of *Pisidium*. I have never seen *C. maculata*, Anton (non Morelet), but have every reason to believe, from the description given of it, that it does not differ materially from this species. In outline it is somewhat similar to *S. barbadense;* it is, however, much smaller, less inflated, and the beaks are much more raised. Compared with *S. meridionale*, and *S. maculatum* of Morelet, it is smaller, more inflated, and the margins are more rounded.

32. Sphærium barbadense, PRIME.—Animal not observed.

Shell small, rounded-oval, ventricose, subequilateral, delicate; anterior side a little the shorter and narrower; margins generally rounded; beaks slightly inclined towards the anterior, nearly central, small, calyculate, approximate at apex, at times eroded; striæ coarse for the size of the

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Fig. 53.

S. barbadense.

shell, though not very distinct; epidermis dark greenish-brown; valves slight, very convex; cardinal teeth very small; lateral teeth strong, very much drawn up and shorter than they usually are in other species.

Long. 0.25; Lat. 0.20; Diam. 0.15 inches.

Hab. Barbados, West Indies. (Cabinet of Prime.)

Sphærium barbadense, PRIME, Proc. Acad. Nat. Sci. Phila. 1861, 415.

I have but one specimen of this species, which seems to be closely allied to *S. bahiense;* it is, however, much larger, more globose, and its beaks are not as much raised.

33. Sphærium modioliforme, ANTON.—Animal not observed. Shell small, ovate oblong, moderately inflated, inequilateral, translucent; anterior and basal margins rounded, posterior somewhat distended and subtruncate; beaks inclined towards the anterior, prominent, calyculate; valves slight, convex; epidermis dark yellow, irregularly spotted with a darker color; striæ hardly visible; teeth very small; hinge-margin somewhat curved, very narrow.

Long. 0.31; Lat. 0.18; Diam. 0.15 inches.

Hab. South America, in Brazil and Venezuela. (Cabinets of the Academy of Natural Sciences of Philadelphia, Bourguignat, Gassies, Museum of Paris, Michaud, and Museum at Leyden.)

Cyclas modioliformis, ANTON, Wiegm. Archiv, 1837, 284.
Pisidium diaphanum, HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1841, 53.
Pisum modioliforme, DESHAYES, Brit. Mus. Cat. 1854, 283.
Pisidium moquinianum, BOURGUIGNAT, Amen. I, 1855, 61, pl. 3, f. 13–17.
Cyclas moquiniana, GASSIES, Pisid. 1855, f. 9.
Cyclas striatella, FÉRUSSAC, Museum of Paris.
Cyclas littoralis, FÉRUSSAC, Collect. Michaud.
Cyclas venezuelensis, PRIME, Museum of Leyden.
Musculium modioliforme, ADAMS, Rec. Gen. II, 1858, 451.

The specimen from which this description was prepared (the original shell from which Mr. Haldeman described the *P. diaphanum*) is in the Cabinet of the Academy of Natural Sciences of Philadelphia; it was discovered in the interior of a large *Ampullaria* from Brazil. I have never seen *C. modioliformis* or *P. moquinianum*, but judging from their descriptions and from the figure of the latter, I do not doubt that they belong to this species. I have had occasion to examine *C. striatella* and *C. littoralis* personally.

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S. modioliforme seems to be rare. It bears some resemblance to *S. meridionale*, but it differs from it in being more inflated and the color is lighter.

34. Sphærium meridionale, PRIME.—Animal not observed. Shell small, transversely-oblong, compressed, delicate, inequilateral; anterior side narrow, shorter; anterior margin somewhat angular, posterior subabrupt, basal slightly rounded; beaks inclined towards the anterior, small, calyculate, approximate at apex; valves slight, compressed, striæ very regular and delicate, hardly perceptible; epidermis yellowish-brown, irregularly mottled with large blotches of a much darker color; hinge-margin very slightly rounded, narrow, much shorter than the basal margin; cardinal teeth diminutive; lateral teeth slight, the posterior tooth much the more elongated.

Fig. 54.

S. meridionale.

Long. 0.33; Lat. 0.20; Diam. 0.12 inches.

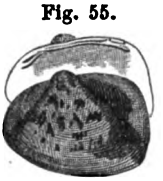
Hab. North America, at Panama. (Cabinets of Prime and Smithsonian Institution.)

Sphærium meridionale, PRIME, Proc. Acad. Nat. Sci. Phila. 1861, 414.

This species is easily distinguished by its very inequilateral and compressed shape. Compared with *S. maculatum*, it is larger, its posterior margin is less abrupt, and its lateral teeth are larger.

35. Sphærium maculatum, MORELET.—Animal not observed. Shell small, transversely-oblong, rhombic, elongated, inequilateral, compressed, delicate; anterior side much the narrower, slightly rounded; posterior side very broad; posterior margin abrupt, forming a straight line from the hinge to the base of the shell; inferior margin nearly straight; valves slight, very little convex; beaks small, calyculate, inclined towards the anterior side; striæ not perceptible; epidermis dark yellowish-brown, irregularly mottled with spots of a much darker color; hinge-margin nearly straight; cardinal teeth very small; lateral teeth strong, elongated.

Fig. 55.



S. maculatum.

Long. 0.25; Lat. 0.18; Diam. 0.12 inches.

Hab. North America, in Yucatan. (Cabinets of Morelet, Jay, Prime and Smithsonian Institution.)

Cyclas maculata, MORELET, Test. nov. Insul. Cub. etc. 1851, 25, pt. 2d.

A rare species; the only specimens I have met with were

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kindly presented to me by the original describer. It is easily distinguished from all other species of *Sphærium* by the very great disproportion which exists between the lateral margins.

36. Sphærium veatleyii, C. B. ADAMS.—Animal not observed. Shell small, transversely elongated, inequilateral, compressed; anterior and inferior margins rounded; posterior margin subtruncate; beaks situated towards the anterior side and inclined in that direction, small, prominent, calyculate; valves slight, interior irregularly spotted with dark blotches; striæ regular, coarse for the size of the shell; epidermis horn color with a tinge of brown; hinge-margin nearly straight; cardinal teeth small but distinct, placed in the shape of the letter V reversed; lateral teeth well developed, elongated.

Fig. 56.

S. veatleyii.

Long. 0.18; Lat. 0.12; Diam. 0.06 inches.

Hab. North America, in the Island of Jamaica. (Cabinets of Jay and Prime.)

Cyclas veatleyii, C. B. ADAMS, Contrib. Conch. 1849, 44.
Pisidium veatleyii, PETIT, Journ. Conch. II, 1851, 421.
Pisum veatleyii, DESHAYES, Brit. Mus. Cat. 1854, 283.
Musculium veatleyii, ADAMS, Rec. Gen. II, 1858, 452.

This rare species, of which I received specimens from the late Prof. Adams, is somewhat allied to *S. portoricense;* it is, however, smaller, more delicate, more elongated, the valves are less full, the beaks less large, and the hinge is more slight.

37. Sphærium portoricense, PRIME.—Animal not observed. Shell small, transversely elongated, rhombic, equilateral, slightly compressed; margins generally straight, in especial the posterior margin; beaks central, slightly inclined towards the anterior side, calyculate, approximate at apex; striæ regular, quite heavy with respect to the size of the shell; epidermis light brownish-yellow; cardinal teeth strong; lateral teeth strong, short; valves solid, very little convex; the interior, and at times the exterior, irregularly spotted with a few dots of very dark color.

Fig. 57.

S. portoricense.

Long. 0.25; Lat. 0.20; Diam. 0.12 inches.

Hab. Portorico, West Indies. (Cabinets of Swift and Prime.)

Sphærium portoricense, PRIME, Proc. Acad. Nat. Sci. Phila. 1861, 415.

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The specimens from which this description was prepared were kindly furnished to me by Mr. Swift, of St. Thomas. In proportion to its size this species is quite robust. It is different from the generality of the West Indian and South American *Sphæria* by its sulcations, which are regular and deep. In shape and appearance it recalls the young of *S. sulcatum*. It is allied to *S. veatleyii* in outline, but otherwise it differs, being heavier and of a larger size.

38. Sphærium parvulum, PRIME.—Animal not observed.

Shell small, transversely-oblong, inequilateral, moderately compressed; beaks calyculate, prominent; anterior side narrower, rounded; posterior subtruncate; striæ very delicate; epidermis greenish-gray; teeth slight, but well marked.

Fig. 58.

S. parvulum.

Long. 0.15; Lat. 0.11; Diam. 0.06 inches.
" 3¾; " 2¾; " 1½ mill.

Hab. At Hamacao in the Island of Portorico, West Indies. (Cabinets of Smithsonian Institution, Morelet and Prime.)

In outline this species offers some resemblance to *S. bahiense*, it is, however, much less inflated.

39. Sphærium viridante, MORELET.—Animal not observed.

Shell small, transversely-oblong, compressed, delicate, inequilateral; anterior side somewhat narrow, shorter, rounded; posterior subabrupt, basal margin slightly rounded; beaks inclined towards the anterior, very small, calyculate, approximate at apex; valves slightly compressed; striæ very regular and delicate; epidermis greenish-brown, irregularly mottled with large blotches of a darker color; hinge margin nearly straight; cardinal teeth diminutive; lateral teeth slight, posterior tooth longer.

Fig. 59.

S. viridante.

Long. 0.24; Lat. 0.18; Diam. 0.13 inches.
" 6½; " 4½; " 3¼ mill.

Hab. At Pointe-à-Pitre in the Island of Guadeloupe, West Indies. (Cabinets of Smithsonian Institution, Morelet and Prime.)

The specimens from which this description was prepared were obtained from the author. This species is very closely allied to *S. meridionale;* it differs, however, in being transversely less long, less produced at the posterior; it is also less compressed. Found not unplentifully.

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40. Sphærium cubense, PRIME.—Animal not observed.

Fig. 60.

S. cubense.

Shell small, transversely-oblong, very inequilateral, compressed; anterior side shorter, narrower, rounded; posterior broad, subtruncate; inferior margin very much curved; beaks small, not much raised; striæ barely visible, epidermis brownish-yellow with spots of a darker color.

Long. 0.16; Lat. 0.10; Diam. 0.09 inches.
" 4; " 2½; " 2¼ mill.

Hab. Sta. Catalina de Guantanamo, Punta de la Jaula and Esperanza, Cuba, West Indies (*fide* Wright). (Cabinets of Smithsonian Institution, Wright, Morelet, Wheatley, and Prime.)

Compared with *S. viridante*, this species is much smaller and more compressed.

FOSSIL SPECIES.

41. Sphærium recticardinale, MEEK and HAYDEN.—"Shell of medium size, transversely subelliptical, rather compressed, very thin; anterior side rounded; base forming a regular semielliptic curve; posterior extremity obliquely subtruncate above and rather narrowly rounded below; cardinal margin long and straight; beaks very small, compressed and projecting but slightly above the hinge, located nearly half way between the middle and the anterior end; surface marked by moderately distinct, irregular lines of growth."

Long. 0.55; Lat. 0.36; Diam. 0.24 inches.

Hab. Near the mouth of Grand River, on the Upper Missouri, Nebraska, United States of America. Tertiary formation. (Cabinet of Smithsonian Institution.)

Sphærium recticardinale, MEEK and HAYDEN, Proc. Acad. Nat. Sci. Phila. 1860, 176.

42. Sphærium planum, MEEK and HAYDEN.—"Shell rather small, broad oval or subcircular, much compressed; extremities more or less regularly rounded, the posterior margin being sometimes faintly subtruncate; base semioval in outline; cardinal margin rounding gradually from near the middle; beaks very small, compressed, and scarcely extending beyond the hinge-margin, nearly central; surface marked by fine, irregular, obscure concentric striæ."

Long. 0.38; Lat. 0.32; Diam. 0.08 inches.

Hab. Near the mouth of Grand River, on the Upper Missouri, Nebraska, United States of America. Tertiary formation. (Cabinet of Smithsonian Institution.)

Sphærium planum, MEEK and HAYDEN, Proc. Acad. Nat. Sci. Phila. 1860, 175.

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43. Sphærium formosum, MEEK and HAYDEN.—"Shell small, oval, oblique, scarcely ventricose; cardinal margin straight; buccal end rounded; anal extremity obliquely truncate; basal margin semielliptical or broadly rounded; beaks obtuse, tumid, rising somewhat above the hinge, nearly touching, placed a little in advance of the middle; surface ornamented by very fine, regular, distinct, concentric wrinkles."

Long. 0.17; Lat. 0.08; Diam. 0.14 inches.

Hab. Three miles above Fort Union, Nebraska, United States of America. Tertiary formation. (Cabinet of Smithsonian Institution.)

Cyclas formosa, MEEK and HAYDEN, Proc. Acad. Nat. Sci. Phila. 1856, 115.

Cyclas fragilis, MEEK and HAYDEN, loc. sub. cit. 1856, 115.

Sphærium formosum, MEEK and HAYDEN, ib. May, 1860, 185.

44. Sphærium subellipticum, MEEK and HAYDEN.—"Shell small, elliptical-ovate, somewhat ventricose, thin and fragile; posterior end narrower than the anterior, both narrowly rounded; base semi-elliptical or semiovate; cardinal border apparently rounding gradually to both extremities; beaks not much elevated, pointed, incurved, not oblique, located near the middle; surface indistinctly marked with lines of growth."

Long. 0.24; Lat. 0.14 inches.

Hab. Three miles above Fort Union, Nebraska, United States of America. Tertiary formation. (Cabinet of Smithsonian Institution.)

Cyclas subelliptica, MEEK and HAYDEN, Proc. Acad. Nat. Sci. Phila. 1856, 115.

Sphærium subellipticum, MEEK and HAYDEN, ib. May, 1860, 185.

"The beaks are so near the middle, and curved so nearly at right angles to the longitudinal diameter of the shell, that it is not easy to determine, especially from the examination of mutilated specimens, which is the posterior or which the anterior end. As we have only seen imperfect specimens, we are not sure the surface markings are indistinct on unworn shells."—M. & H.

PISIDIUM, PFEIFFER.[1]

Pectunculus, LIST. 1685.—*Musculus*, GAULT. 1742.—*Tellina*, MÜLLER, 1774.—*Sphærium*, SCOP. 1777.—*Cardium*, POLI, 1791.—*Cyclas*, LAMK. 1818.—*Pera*, *Euglesia*, *Cordula*, LEACH, 1820.—*Physemoda*, RAF. 1820.—*Pisidium*, PF. 1821.—*Gallileja*, DA COSTA, 1839.—*Pisum*, GRAY (non MEGERLE), 1847.—*Musculium*, GRAY (non LINK), 1851.

Animal elongate-oval, compressed laterally; lobes of the mantle without tentacles, united posteriorly into a single, short

[1] Pfeiffer, Deütsch. moll. 1821.

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syphonal tube; oral aperture small, tentacles of the mouth triangular, elongated; gills of medium size; foot small, tongue-shaped, capable of great extension.

Shell small, rounded-oval, inequilateral, anterior side longer; beaks terminal; cardinal teeth double, at times united, situated immediately under the beaks; lateral teeth elongated, lamelliform, double in the right valve, single in the left valve; ligament always on the shorter side.

This genus was instituted by Pfeiffer for a class of shells which, by the older authors, had been confounded with *Tellina*, and more recently with *Sphærium*. The differences which exist between *Pisidium* and *Sphærium*, which led Pfeiffer to establish this new genus, are very material, both in the animal and in the shell. The animal of *Pisidium* has the lobes of the mantle united posteriorly into one syphonal tube; whereas in *Sphærium*, the lobes form a tube, single at its base, but double at the extremity. According to M. Deshayes there is much difference in the formation of the foot of *Pisidium* from that of *Sphærium*—that of the former being somewhat similar to that of *Cardium*. This organ is capable of great extension, and when prolonged to its utmost extent, is not unlike that of *Lucina;* it is made use of much in the same manner as that of *Sphærium*, either to burrow into the ground or to crawl on solid bodies.

With regard to the shell, the main difference consists in the position of the beaks. In *Pisidium* the beaks are terminal, that is, the distance from the beaks to the anterior extremity is greater than the distance from the beaks to the posterior extremity. In *Sphærium*, on the contrary, the position of the beaks is generally central, dividing the hinge-margin into equal portions. The formation of the hinge of *Pisidium* is very similar to that of *Sphærium;* the position of the cardinal teeth, however, in *Pisidium* is terminal, like that of the beaks, whereas in *Sphærium* it is central. The teeth of *Pisidium* are, in proportion to the size of the shell, more robust than in *Sphærium*.

The habits and mode of living of the species of these two genera are very much the same. They are found buried an inch or more in the mud under water, or else attached to the roots or stems of aquatic plants.

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Their mode of breeding is much the same, both ejecting the young when sufficiently mature, which up to that time they carry between the folds of the gills. Pfeiffer supposes the *Pisidium* to breed by throwing out eggs, but I have myself found young in the shells of *Pisidium*.

The most appropriate time of the year for collecting *Pisidium*, in the North, would seem to be from the middle of April to the early part of July—the season during which they breed; some species, however, such as *P. variabile*, I have found at all seasons, even in winter; others, such as *P. ventricosum*, are seldom found but in the early summer. Live specimens may be preserved for examination, for some time, if the water is kept sufficiently fresh. On the application of water, slightly warmed, they exhibit great activity, extending their syphonal tube and foot. They not only crawl on the sides of the vessel, in which they are confined, but also on the under surface of the water. They are very similar in some of their movements to certain species of fluviatile *Gasteropods*.

While this genus has of late years been generally adopted by the Conchologists of Europe, and more recently by those of this country, some English authors have committed the error of applying to it the names of *Pisum* and *Musculium*—a great carelessness on their part, as the types of these two genera, as set out by their respective describers, Megerle and Link, are genuine *Sphæria*.

The genus *Pisidium* is very abundantly distributed over both sections of this continent; and while the species of America are entirely distinct as such from those found elsewhere, their forms present, in nearly every instance, great analogies with those of the species of Europe and of Asia.

1. Pisidium virginicum, Bourguignat.—Shell large, thick, oblique, very inequilateral; anterior side longer, narrower, rounded; posterior broader, subtruncate at end, basal margin rounded; beaks situated posteriorly, large, prominent; valves solid, moderately convex, interior light blue; striæ coarse and irregular; epidermis greenish-brown or chestnut color, with zones; hinge-margin very much curved; hinge broad, two strong cardinal teeth, disposed in the shape of the letter V reversed; lateral teeth strong, short.

Fig. 61.

P. virginicum.

Long. 0.35; Lat. 0.29; Diam. 0.21 inches.

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Hab. North America, in New England, in the States of New York, New Jersey, Pennsylvania, Ohio, Wisconsin, Michigan, Maryland and Virginia, and in the St. Charles River at Quebec in Canada. (Cabinets of the Boston Society, the Academy of Natural Sciences of Philadelphia, Smithsonian Institution, Jay, Prime, and others.)

Tellina virginica, GML., 1788, 3236, pl. clix, f. 15.
Tellina pusilla (pars), DILLW. II, 1817, 106.
Cyclas dubia, SAY, Nich. Encycl. 3d ed. 1819, f. 4, pl. i, f. x.
Physemoda æqualis, RAFINESQUE, Ann. Gen. Sci. Phy. V, 1820, 319.
Pisidium abruptum, HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1841, 53.
Pisidium dubium, HALDEMAN, loc. sub. cit. I, 1841, 103.
Pisidium æquale, RAFINESQUE, Prime in Bost. Jour. VI, 1852, 367.
Pisidium virginicum, BOURGUIGNAT, Amer. Malac. I, 1853, 53.
Sphærium dubium, DESHAYES, Biv. Brit. Mus. 1854, 266.
Pisum virginicum, DESHAYES, loc. sub. cit. 1854, 281.
Pisum abruptum, DESHAYES, loc. sub. cit. 1854, 281.
Pisum dubium, DESHAYES, loc. sub. cit. 1854, 282.
Musculium dubium, ADAMS, Rec. Gen. II, 1858, 451.
Musculium abruptum, ADAMS, loc. sub. cit. II, 1858, 451.
Musculium virginicum, ADAMS, loc. sub. cit. II, 1858, 452.

This, the largest species of the genus found in America, is not easily confounded with any other—its size, and general robust and coarse appearance, rendering it at once distinct. The young shell is more elongated and less full than the adult, and of a lighter color. Found not unplentifully in running waters.

Compared with *P. adamsi*, to which it bears some resemblance in outline, it is larger, more robust, more produced on the anterior side, less full, the beaks are larger, the markings on the surface are heavier, and the color is darker.

Its foreign analogue is *P. amnicum*, of Europe, to which it is very closely allied; it differs, however, in being somewhat smaller and more oblique.

Fig. 62.

P. virginicum.

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2. Pisidium adamsi, PRIME.[1]—Shell subovate, full, oblique, inequilateral; anterior side a little longer, narrower, slightly produced at end; posterior side broader, somewhat subtruncate at end, basal margin rounded; beaks small, a little raised, approximate at apex; surface smooth, striæ very delicate; color light gray, interior whitish; hinge-margin curved; cardinal teeth very small; lateral teeth very distinct.

Fig. 63.

P. adamsi.

Long. 0.3; Lat. 0.24; Diam. 0.2 inches.

Hab. North America, at Norway in the State of Maine, and at Holly, Oakland Co., Michigan. (Cabinets of the Boston Society, Smithsonian Institution, and Prime.)

Cyclas nitida, MIGHELS (non HANLEY), Bost. Proc. I, 1841, 48.
Pisidium adamsi, PRIME, Stimp. Moll. New Engl. 1851, 16.
Sphærium nitidum, DESHAYES, Biv. Brit. Mus. Cat. 1854, 271.

A rare species. I have never seen any specimens but those in the collection of the Boston Society and those in my own, all of which came from Professor Adams, who discovered it with Dr. Mighels. The young is elliptical, obliquely striate and compressed. The so-called *Cyclas nitida*, from Connecticut and New Hampshire, is *P. variabile.*

Compared with *P. variabile*, this species is larger, comparatively more delicate, less oblique, less heavily striated, of a lighter color. It is much more oblique and less elongated than *P. abditum.* It is more oblique, and more inflated than *P. virginicum;* it is also more delicate than that species.

Fig. 64.

P. adamsi.

3. Pisidium æquilaterale, PRIME.—Shell small, stout, heavy, somewhat inflated, rhomboidal, subequilateral; posterior margin a little

[1] Not to be confounded with *Pisum adamsi* of DESHAYES, Biv. Brit. Mus. 1854, 284, which is the *P. jamaicense*, PRIME.

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angular where it meets the basal margin; inferior and anterior margins slightly rounded; beaks central, large, prominent, rounded, not approximate; valves very solid, moderately convex, interior light blue; striæ fine, surface glossy, epidermis very variable in color, light yellow, greenish or brown; hinge-margin curved, cardinal teeth small, lateral teeth strong, distinct.

Fig. 65.

P. æquilaterale.

Long. 0.15; Lat. 0.14; Diam. 0.10 inches.

Hab. North America, in the States of Maine, Massachusetts and New York. (Cabinets of the Boston Society, Smithsonian Institution, Lewis, Jay, and Prime.)

Pisidium æquilaterale, PRIME, Bost. Jour. VI, 1852, 366, pl. xii, f. 23–25.

This species is remarkable for its solidity and for its short and quadrangular form, the latter gives it somewhat the appearance of a *Sphærium;* it is the most equilateral *Pisidium* I know of.

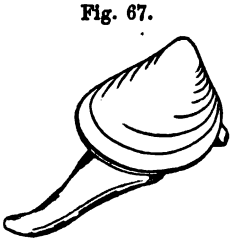
Compared with *P. variabile*, to which at first sight it bears a general resemblance from the gloss and color of its epidermis, it differs very materially in not being at all oblique, and in being equilateral; it is also much less full. Somewhat rare. I discovered it in the spring of 1852, in a clay pit in the neighborhood of Augusta, Maine, in company with *P. compressum.*

Fig. 66.

P. æquilaterale.

4. Pisidium compressum, PRIME.—Shell solid, very oblique, trigonal, triangular, subequilateral, very much drawn up in the region of the beaks, inflated in adult; anterior side a little longer, narrower, produced at the end, posterior broader, subtruncate; beaks placed a little posteriorly, small, raised, with a wing-shaped appendage on the summits, distant; striæ distinct, regular; epidermis very variable, yellow, gray or chestnut color; valves solid, varying in inflation, interior light blue; hinge thick; cardinal teeth small, robust, compressed, disposed in the shape of the letter V reversed; lateral teeth distinct, short, strong, placed at an obtuse angle with the hinge proper.

Fig. 67.



P. compressum.

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Long. 0.16; Lat. 0.14; Diam. 0.09 inches.

Hab. North America, in New England, in the States of New York, Pennsylvania, Ohio, and California, and at Montreal and Quebec in Canada. (Cabinets of the Boston Society, Smithsonian Institution, Jay, Prime, and others.)

Cyclas altilis, ANTHONY, in litt., 1847.
Pisidium compressum, PRIME, Bost. Proc. IV, 1851, 164.
Pisidium altile, ANTH. Prime, Bost. Jour. VI, 1852, 353, pl. xi, f. 10–12.
Pisidium cicer, PRIME, Ann. N. Y. Lyc. VI, 1853, 65, pl. i, f. 1.
Pisum compressum, DESHAYES, Biv. Brit. Mus. 1854, 282.
Pisum altile, DESHAYES, loc. sub. cit. 1854, 280.
Musculium compressum, ADAMS, Rec. Gen. II, 1858, 451.
Musculium altile, ADAMS, loc. sub. cit. II, 1858, 451.
Musculium cicer, ADAMS, loc. sub. cit. II, 1858, 451.
Pisum cicer, ADAMS, loc. sub. cit. II, 1858, 660.

This species, though perfectly distinct and well characterized, is subject to much variation; its very oblique shape is constant; in fulness it is exposed to much change, some old specimens are remarkably obese; the young are generally more elongated and more compressed.

One of the peculiarities of this species, which, however, is at times wanting, from abrasion or from other causes, is the very singular shape of the apex of the beaks, which assume the appearance of wings placed on the summit of the umbos.

P. cicer, from Greenwich, which I place with this species, differs a little from the type of *P. compressum*, in being larger, more inflated; the beaks also are larger, and do not exhibit the winged appendage. *P. altile*, a mere variety, is more oblique than the type, and does not possess the appendage on the beaks. Both these varieties are darker in color than the true *P. compressum*.

The foreign analogue, *P. conicum*, from France, is so closely allied to our species that it is with the greatest care only that they may be separated.

P. compressum is more trigonal and less inflated than *P. variabile;* it is more equilateral than either *P. virginicum*, *adamsi*, or *abditum*, and more oblique and less equilateral than *P. æquilaterale*.

The animal is remarkable for its liveliness. It is found sparingly

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during the spring, and not at all in winter. It inhabits both running and still water, and buries itself somewhat in the mud.

Fig. 68.

P. compressum.

5. Pisidium variabile, PRIME.—Shell heavy, oblique, inequilateral, inflated; anterior side longer, narrower, somewhat angular at end; posterior subtruncate; beaks situated posteriorly, full, prominent, not approximate at apex; valves solid, interior light blue; striæ regular, but very distinct; epidermis glossy, very variable, straw color or greenish-brown with a yellow zone on the basal margin; hinge-margin curved; hinge rather slight; cardinal teeth united, small; lateral teeth distinct, strong, short.

Fig. 69.

P. variabile.

Long. 0.21; Lat. 0.18; Diam. 0.17 inches.

Hab. North America, in New England, and in the States of New York, Pennsylvania, and Virginia. (Cabinets of Jay, Smithsonian Institution, Prime, and others.)

Cyclas nitida, MIGHELS, Linsley, Amer. Jour. XLVIII, 1845, 276.
Pisidium variabile, PRIME, Bost. Proc. IV, 1851, 163.
Pisidium grande, WHITTEMORE, in litt. 1855.
Musculium variabile, ADAMS, Rec. Gen. II, 1858, 452.
Pisum variabile, ADAMS, loc. sub. cit. II, 1858, 660.

This species has hitherto always been looked upon by collectors as the *P. virginicum;* but having compared it with the original shells, described as *Cyclas dubia*, Say, by Dr. Gould, in his Report, and with some specimens of *P. virginicum* from Westfield, Mass., sent to me by Prof. C. B. Adams, as well as with some others sent to me from Philadelphia, by Prof. S. S. Haldeman, I have become convinced that it is different from Say's shell. Compared with the young of *P. virginicum*, it is more oblique, less elongated, more inflated, and of a different color. This species is not so elongated as the *P. virginicum;* it is more inflated, the beaks are larger and more tumid, it is also a much

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smaller shell. Say describes *Cyclas dubia* as being six-twentieths of an inch in length; *P. variabile* is only four-twentieths of an inch in length, and that it is a full grown shell, I am led to believe not only from its heavy striations and mature appearance in general, but also from having found young in the shell. The young is not so oblique as the adult, it is more elongated, less inflated, and of a light yellow color. As a general rule, the coloring of this species varies much in different localities. The specimens collected from Rowley, Essex County, Mass., are larger than any I have seen from other places; their color is also lighter. The animal is remarkable for its want of activity. This is one of our most common species, being found in nearly every stream, and at all seasons of the year, though most plentifully during the spring.

Fig. 70.

P. variabile.

6. Pisidium nov-eboracense, PRIME.—Shell rounded-oval, very inequilateral, inflated, margins rounded; anterior side considerably produced, narrower; beaks situated posteriorly, large, full, prominent; valves comparatively slight, interior light blue; striæ irregular; epidermis variable, generally greenish-yellow or brown; hinge-margin a little curved; hinge slight, narrow; cardinal teeth double, very small; lateral teeth elongated.

Fig. 71.

P. nov-eboracense.

Long. 0.35; Lat. 0.18; Diam. 0.13 inches.

Hab. North America, in the State of New York. (Cabinets of Smithsonian Institution, Lewis, Jay, and Prime.)

Pisidium nov-eboracense, PRIME, Ann. N. Y. Lyc. VI, 1853, 66, pl. i, f. 3.
Pisidium amplum, INGALLS in litt. 1855.
Musculium nov-eboracense, ADAMS, Rec. Gen. II, 1858, 451.
Pisum nov-eboracense, ADAMS, loc. sub. cit. II, 1858, 660.

This species, for its size, is comparatively delicate. It seems to be intermediate between *P. abditum* and *P. variabile;* it is less elongated and more tumid than the former, and less oblique and more elongated than the latter. Found only in two places, at Greenwich and at Mohawk, in the State of New York.

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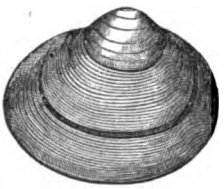
7. Pisidium abditum, HALDEMAN.—Shell rounded-oval, elongated, very inequilateral, moderately convex, margins well rounded, beaks placed nearer the posterior side, small, slightly raised; surface smooth, striæ not distinct, epidermis variable, generally light straw color; hinge-margin very nearly straight; cardinal teeth small, separate, the anterior tooth larger and more prominent; lateral teeth small, not much elongated.

Fig. 72.



P. abditum.

Long. 0.15; Lat. 0.14; Diam. 0.09 inches.

Hab. North America, in New England, in the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, South Carolina and California, in the Lake Superior region, at Montreal in Canada, and in Honduras. (Cabinets of Jay, Cuming, Prime, Smithsonian Institution, and others.)

Pisidium abditum, HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1841, 53.
Cyclas minor, C. B. ADAMS, Bost. Proc. I, 1841, 48.
Pisidium tenellum, GOULD, Agassiz, Lake Super. 1848, 245.
Pisidium obscurum, PRIME, Bost. Proc. IV, 1851, 161.
Pisidium rubellum, PRIME, loc. sub. cit. IV, 1851, 163.
Pisidium minus, STIMPSON, Moll. New Engl. 1851, 16.
Pisidium kurtzi, PRIME, Bost. Proc. IV, 1851, 162.
Pisidium zonatum, PRIME, loc. sub. cit. IV, 1851, 162.
Pisidium regulare, PRIME, Bost. Jour. VI, 1852, 363, pl. xii, f. 11, 12.
Pisidium notatum, PRIME, loc. sub. cit. VI, 1852, 365, pl. xii, f. 20–22.
Pisidium arcuatum, PRIME, loc. sub. cit. VI, 1852, 364, pl. xii, f. 14–16.
Pisum abditum, DESHAYES, Brit. Mus. Cat. 1854, 282.
Pisum minus, DESHAYES, loc. sub. cit. 1854, 281.
Pisidium resartum, INGALLS, in litt. 1855.
Pisidium rubrum, LEWIS, in litt. 1855.
Pisidium plenum, LEWIS, in litt. 1855.
Musculium abditum, ADAMS, Rec. Gen. II, 1858, 451.
Musculium minus, ADAMS, loc. sub. cit. II, 1858, 451.
Musculium rubellum, ADAMS, loc. sub. cit. II, 1858, 452.
Musculium obscurum, ADAMS, loc. sub. cit. II, 1858, 452.
Musculium kurtzi, ADAMS, loc. sub. cit. II, 1858, 451.
Musculium zonatum, ADAMS, loc. sub. cit. II, 1858, 452.
Pisum obscurum, ADAMS, loc. sub. cit. II, 1858, 660.
Pisum kurtzi, ADAMS, loc. sub. cit. II, 1858, 660.
Pisum rubellum, ADAMS, loc. sub. cit. II, 1858, 660.
Pisum zonatum, ADAMS, loc. sub. cit. II, 1858, 660.
Pisidium retusum, PRIME, Proc. Zool. XXVIII, 1860, 322.

This species is distributed over such a vast area of country, and varies so much according to the different localities in which it is found, that it is hardly surprising that its numerous varieties

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should have been mistaken for so many species. *P. casertanum*, its foreign analogue, to which it bears the closest resemblance, and from which it is very difficult to separate it, is likewise widely distributed and subject to much variation.

P. abditum is our most common species, and occurs generally in great numbers; its epidermis, though usually light yellow, is at times, according to the habitat of the shell, of a much darker color; the surface is at times also quite rough and the striæ coarse.

Compared with *P. nov-eboracense*, to which it is nearly allied, it differs in being less heavy, more rounded, less full, the beaks are less large, the hinge-margin is straighter, the anterior extremity, which in the *P. nov-eboracense* forms a declivity from the beaks, is more regularly rounded, the distance from the beaks to the basal margin is less great, the exterior surface is much smoother, and the epidermis of a lighter color.

Fig. 73.

P. abditum.

8. Pisidium simile, Prime. — Shell rounded-oval, very much elongated, very inequilateral, slightly compressed; anterior side rounded, posterior subabrupt; beaks moderately full, raised; surface smooth, epidermis light straw color; hinge-margin nearly straight.

Fig. 74.

P. simile.

Long. 0.14; Lat. 0.13; Diam. 0.07 inches.

Hab. At Guadeloupe, in the West Indies. (Cabinets of Smithsonian Institution, Morelet, and Prime.)

This species bears the greatest resemblance to *P. abditum* in outline and size; it is, however, a little more elongated, and more compressed.

9. Pisidium chilense, Deshayes.—Shell small, delicate, moderately inflated, elongated, inequilateral; anterior side a little longer, angular at end, posterior subtruncate; beaks large, full, somewhat raised; striæ very fine, surface smooth; epidermis light yellow; hinge-margin nearly straight; cardinal teeth small, but distinct; lateral teeth a little elongated.

Fig. 75.

P. chilense.

Hab. South America, at Valparaiso, and at Coquimbo in Chili. (Cabinets of Smithsonian Institution, Cuming, and Prime.)

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Cyclas chilensis, D'Orbigny, Voy. en Amér. 1846, 568, pl. 83, f. 11–13.
Pisidium chilense, Deshayes, Biv. Brit. Mus. 1854, 284.
Pera chilensis, Gray, Brit. Mus. Shells of S. Amer. 1854, 69.
Pisum chilense, Deshayes, Biv. Brit. Mus. 1854, 284.
Musculium chilense, Adams, Rec. Gen. II, 1858, 451.
Corbicula chilensis, Prime, Proc. Acad. Nat. Sci. Phila. 1860, 269.
Pisidium angulatum, Prime, Proc. Zool. XXVIII, 1860, 322.

I have not seen any original specimens of this species; but from the description and figure given of it by M. D'Orbigny, I have no doubt that it is the same shell I described as new from the collection of Mr. Cuming, under the name of *P. angulatum*.

Compared with *P. abditum*, to which it bears a general resemblance, it is smaller, a little more full, less elongated, and less rounded laterally.

10. Pisidium jamaicense, Prime.—Shell small, oval, short, subequilateral, somewhat compressed; anterior side very little longer, somewhat narrower, tapering to a well-rounded extremity; posterior subtruncate; beaks small, not prominent; striæ not perceptible, surface smooth, epidermis light straw color; cardinal teeth small, lateral teeth moderately developed.

Fig. 76.

P. jamaicense.

Long. 0.083; Lat. 0.075; Diam. 0.05 inches.

Hab. Jamaica, in the West Indies. (Cabinet of Prime.)

Cyclas pygmea, C. B. Adams, Contrib. Conch. 1849, 44.
Pisum adamsi,[1] Deshayes, Biv. Brit. Mus. 1854, 284.
Musculium pygmeum, Adams, Rec. Gen. II, 1858, 452.
Pisum pygmeum, Adams, loc. sub. cit. II, 1858, 660.

A rare species. The only specimens I have seen are those in my cabinet, which I received some years since from the late Professor Adams. Remarkable for its short, compact appearance.

11. Pisidium pulchellum, Deshayes.[2]—P. testa ovata, inflata, tenui, sublævigata, epidermide viridescente, inæquilaterali; latere antico elongato, rotundato; latere postico brevi, obtuso; intus albicante.

Hab. South America, at Maldonardo in Uruguay.

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[1] Not to be confounded with *Pisidium adamsi*, Prime (*Cyclas nitida*, Mighels), from Maine.

[2] Not to be confounded with *Cyclas pulchella*, Hanley, or *Pisidium pulchellum*, Jenyns, a variety of *P. casertanum*, Poli.

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Cyclas pulchella,[1] D'Orbigny, Guer. Mag. Zool. 1835.
Pisidium pulchellum, Deshayes, Biv. Brit. Mus. 1854, 283.
Pisum pulchellum, Deshayes, Biv. Brit. Mus. 1854, 283.
Musculium pulchellum, Adams, Rec. Gen. II, 1858, 452.
Sphærium pulchellum, Prime, Proc. Acad. Nat. Sci. Phila. 1860, 297.

It has not been my good fortune to meet with this species, which M. D'Orbigny likens to *P. fontinale*, of France; he found it in considerable abundance.

12. Pisidium ferrugineum,[2] Prime.—Shell small, rounded-oval, globose, slightly inequilateral; anterior side somewhat produced; margins rounded; beaks tubercular at apex, very distant; surface smooth; epidermis light yellow; hinge-margin rounded; cardinal teeth large, separate, anterior tooth more prominent; lateral teeth distinct.

Fig. 77.

P. ferrugineum.

Long. 0.17; Lat. 0.13; Diam. 0.11 inches.

Hab. North America, in the States of Maine and New York. (Cabinets of the Boston Society, Smithsonian Institution, Lewis, Jay, and Prime.)

Pisidium ferrugineum, Prime, Bost. Proc. IV, 1851, 162.

Remarkable for the elevation of its beaks, which stand forth on the upper portion of the shell in the shape of large tubercles, which are generally coated with some dark ferruginous substance. It differs from *P. abditum* in being smaller, more inflated, not so elongated, and more equilateral.

One of our most common species, found usually in company with *P. variabile* and *P. ventricosum*.

Fig. 78.

P. ferrugineum.

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[1] Not to be confounded with *Cyclas pulchella*, Hanley, or *Pisidium pulchellum*, Jenyns, a variety of *P. casertanum*, Poli.

[2] Not to be confounded with *Pisum ferrugineum*, Deshayes, Biv. Brit. Mus. 1854, 281, which is *Sphærium ferrugineum*, Krauss, of Africa.

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13. Pisidium ventricosum, PRIME. — Shell small, rounded-oval, globose, ventricose, somewhat oblique, slightly inequilateral, anterior side produced, posterior subtruncate; beaks small, protuberant, distant, situated towards the posterior side; surface smooth, yellow; hinge-margin curved; cardinal teeth separate; lateral teeth short.

Fig. 79.

P. ventricosum.

Long. 0.11; Lat. 0.095; Diam. 0.085 inches.

Hab. North America, in the State of Massachusetts. Cabinets of the Boston Society, Smithsonian Institution, Lewis, Jay, Prime, and others.)

Pisidium ventricosum, PRIME, Bost. Proc. IV, 1851, 68.
Musculium ventricosum, ADAMS, Rec. Gen. II, 1858, 452.
Pisum ventricosum, ADAMS, loc. sub. cit. II, 1858, 660.

This small, globose species is not likely to be confounded with any other but *P. rotundatum*, than which, however, it is more oblique, the margins are more abrupt, and the beaks more terminal and very much smaller. It is very nearly allied to *P. obtusale*, of Europe.

Fig. 80.

P. ventricosum.

14. Pisidium rotundatum, PRIME. — Shell small, rounded-oval, globose, ventricose, inflated, subequilateral; anterior and basal margins rounded, posterior margin somewhat abrupt; anterior side a little longer: beaks nearly central, very large, prominent, rounded; surface glossy, yellow, somewhat darker in the region of the beaks; hinge-margin curved; teeth small.

Fig. 81.

P. rotundatum.

Long. 0.09; Lat. 0.07; Diam. 0.08 inches.

Hab. North America, in the region of Lake Superior. (Cabinets of Agassiz and Prime.)

Pisidium rotundatum, PRIME, Bost. Proc. IV, 1851, 164.
Musculium rotundatum, ADAMS, Rec. Gen. II, 1858, 452.
Pisum rotundatum, ADAMS, loc. sub. cit. II, 1858, 660.

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This species, allied only to *P. ventricosum*, is remarkable for the fulness of the beaks, which are not raised in proportion.

Fig. 82.

P. rotundatum.

15. Pisidium occidentale, NEWCOMB.—P. testa rotundato-ovata, obliqua, inequilatera, hyalina vel fusco-cornea; natibus approximatis vic prominentibus; striæ minutissimæ.

Long. 4; Lat. 3¾ mill.

Hab. North America, at San Francisco (Ocean House), California. (Cabinet of Newcomb.)

Pisidium occidentale, NEWCOMB, Proc. Calif. Acad. Nat. Sci. II, 1863, 94.

I have not seen this species, which Dr. Newcomb says is allied to *P. variabile.*

FOSSIL SPECIES.

16. Pisidium contortum, PRIME.—Shell elongated, subrhomboidal, inequilateral, somewhat compressed; anterior side produced, angular at end; posterior side short, subabrupt; hinge and basal margins nearly straight; beaks terminal, raised above the outline of the valves; striæ light; hinge comparatively strong; cardinal teeth distinct; lateral teeth elongated.

Fig. 83.

P. contortum.

Long. 0.13; Lat. 0.07; Diam. 0.05 inches.

Hab. North America, at Pittsfield, Massachusetts. Post Pleiocene formation. (Cabinets of Smithsonian Institution, and Prime.)

Pisidium contortum, PRIME, Ann. N. Y. Lyc. VI, 1853, 65, pl. i, f. 2.

This species, which occurs rarely, was discovered, by Dr. Shurtleff, in company with *P. ventricosum.*

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APPENDIX.

7′. Corbicula perplexa, Prime.—Testa transversa, ovato-subtrigona, inæquilaterali, compressa; latere antico breviore, rotundato; transversim dense et irregulariter striata; epidermide squalide virescente vestita.

Fig. 84.

Corbicula perplexa.

Shell transverse, oval, subtrigonal, inequilateral, compressed; anterior side shorter, rounded; posterior side somewhat narrower at extremity; valves moderately solid, interior purplish-white with purple markings under the posterior lateral tooth and with distant and more or less distinct purple lines radiating from the apex of the shell towards the basal margin; striæ very close, irregular and indistinct; epidermis of a soiled green; beaks small, somewhat raised; hinge-margin broad with three unequal diverging cardinal teeth, the principal ones bifurcated; anterior cardinal tooth in the right valve nearly obsolete; palleal impression terminating in a small and short sinus.

Long. .48; Lat. .40 inch.
" 12; " 10 mill.

Hab. South America. (Cabinet of Prime.)

This species is very closely allied to *Corb. limosa;* it is however much smaller, more transverse, more produced on the posterior side; the hinge is less solid, and the cavity of the valves is deeper. I have failed to discover in any specimens of *Corb. perplexa* the radiating colored lines, which are frequently met with on the epidermis of *Corb. limosa.*

15′. Pisidium ultramontanum, Prime.—Testa ovato-suborbiculari, subinæquilaterali, compressa, solidiuscula; umbonibus parvis, subdepressis, parum prominulis.

Fig. 85.

Pisidium ultramontanum.

Shell comparatively solid, oval-suborbicular, subinequilateral, compressed; anterior side much produced between the extremity of the lateral tooth and the junction with the basal margin; posterior margin rounded; beaks small, not full, not much raised above the outline of the shell; valves shallow in the cavity; hinge strong; striæ delicate; epidermis light brownish horn color.

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Long. .20; Lat. .16 inch.
" 5; " 4 mill.

Hab. North America, Canoe Creek in California. (Cabinets of the Smithsonian Institution and Prime.)

Remarkable for its spherical and flattened appearance; it is unlike any other species indigenous or foreign.

15." Pisidium consanguineum, PRIME.—Testa minuta, transversa, rotundato-ovata, inæquilaterali, compressiuscula; marginibus rotundatis; tenuissime striata; umbonibus tumidiusculis.

Fig. 86.

Pisidium consanguineum.

Shell small, transverse, rounded-oval, inequilateral, not much inflated; margins rounded; beaks somewhat apiculated; striæ very delicate; epidermis light horn color; teeth robust.

Long. .16; Lat. .12; Diam. .12 inch.
" 4; " 3; " 3 mill.

Hab. Retiro, Monte Verde and Catalina da Guarra, Cuba, West Indies (*fide* Wright). (Cabinet of Smithsonian Institution, Wright, Wheatley, and Prime.)

Very closely allied to *Pisid. abditum*, from which it is very difficult to distinguish it.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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CHECK LIST

OF THE

INVERTEBRATE FOSSILS

OF

NORTH AMERICA.

EOCENE AND OLIGOCENE.

BY

T. A. CONRAD.

WASHINGTON:
SMITHSONIAN INSTITUTION.
MAY, 1866.

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THE following Lists of the described species of Invertebrate Fossils of North America have been prepared at the request of the Institution for the purpose of facilitating the labelling of the collections and the distribution of duplicate specimens.

It will be understood that the Smithsonian Institution does not vouch for the accuracy of the Lists, or for their completeness, and that the responsibility in reference to these points rests with the authors.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION,
WASHINGTON, April, 1866

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OLIGOCENE.

(Vicksburg Group.)

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CHECK LIST

OF THE

INVERTEBRATE FOSSILS OF NORTH AMERICA.

A. EOCENE.[1]

1. LOWER AND MEDIAL EOCENE.

SUBKINGDOM **PROTOZOA.**

CLASS **RHIZOPODA.**

Order **FORAMINIFERA.**

Camerinidæ.

1. **Cristellaria rotella,** *Conrad.* Flor.
2. **Nemophora floridana,** *Conrad.* Flor.

[1] The Eocene Period in North America may be subdivided into three distinct groups, which I believe hold few, if any, species in common. These I have designated "Lower, Medial, and Upper Eocene." Localities of the first subdivision occur near Washington, D. C.; Piscataway and Upper Marlboro', Md.; Pamunkey River, Va.; Shark River, N. J.; and at Claiborne in the lowest bed, only visible in a low stage of the water. The second subdivision occurs in the fossiliferous sand in the upper part of Claiborne Bluff, immediately beneath the Upper Eocene limestone. A portion of the Buhr Stone of South Carolina and Georgia falls in this section, as well as the "Shell Bluff Group" on the Savannah River. All the Eocene species of New Jersey are from Shark River, Monmouth Co., except *Ostrea georgiana*, Conrad.

As the Eocene of Georgia has not been generally investigated, the Echinodermata of that State are only provisionally referred to the Jackson Group.

The portion of the Check List which includes the land and fresh-water shells is published on the authority of F. B. Meek.

An asterisk (*) is prefixed to the Lower Eocene species to distinguish them from those of the Medial Eocene.

The Upper Eocene species form a separate list, beginning on p. 21.

There are five distinct Tertiary formations between the Cretaceous and Miocene epochs. 1. Shark River Group; 2. Claiborne Group; 3. Shell Bluff Group; 4. Jackson Group; 5. Vicksburg Group. The three lower divisions are referred to the Eocene, and the first list includes the fossils of the two oldest divisions, but each of the newer groups has a separate list, beginning respectively on pages 20, 21, and 26.

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Subkingdom RADIATA.

Class POLYPI.

Order ACTINARIA.

Turbinolidæ.

3.	**Platytrochus Goldfussii,** (*Lea*) *Edwards.*	Ala.
4.	**Platytrochus Stokesii,** (*Lea*) *Edwards.*	Ala.
5.	**Paracyathus ? serrulus,** *Conrad.*	Ala.
6.	**Turbinolia pharetra,** *Lea.*	Ala.
7.	**Osteodes elaborata,** *Conrad.*	Ala.
8.	**Flabellum cuneiforme,** (*Conrad*) *Lonsdale.*	S. Car.

Madreporidæ.

9.	**Endopachys alticostatum,** *Conrad.*	Ala.
10.	**Endopachys Maclurii,** (*Lea*) *Conrad.*	Ala
11.	**Endopachys triangulare,** *Conrad.*	Ala.

Class ECHINODERMATA.

Order ECHINOIDEA.

Scutellidæ.

12.	**Mortonia (Periarchus) Lyelli,** *Conrad.*	Ala.

Subkingdom MOLLUSCA

Class POLYZOA.

Escharidæ.

13.	**Lunulites interstitia,** *Lea.*	Ala.
14.	**Escharianella linea,** *Gabb & Horn.*	S. Car.

Flustrellaridæ.

15.	**Discoflustrellaria Bouei,** (*Lea*) *Gabb & Horn.*	Ala.
16.	**Capularia discoidea,** (*Lea*) *Gabb & Horn.*	Ala.
17.	**Heteractis Duclosii,** (*Lea*) *Gabb & Horn.*	Ala.

Class BRACHIOPODA.

Terebratulidæ.

18.	**Rhynchonella nitens,** *Conrad.*	Or.
19.	**Rhynchonella wilmingtonensis,** (*Lyell & Sowerby*) *Conrad.*	N. Car.

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Class LAMELLIBRANCHIATA.

Anomiidæ

20. *Anomia Ruffini, *Conrad.*	Va.
21. *Placunanomia inornata, *Gabb.*	Cal.

Ostreidæ.

22. Ostrea alabamiensis, *Lea.*	Ala.
23. Ostrea carolinensis, *Conrad.*	S. Car.
24. Ostrea compressirostra, *Say.*	Md.
25. Ostrea divaricata, *Lea.*	Ala.
26. Ostrea falciformis, *Conrad.*	Ala.
27. *Ostrea sellæformis, *Conrad.*	Ala.; S. C.; Va.
28. Ostrea subtrigonalis, *Evans & Shumard.*	Dak.; Idaho.
29. *Gryphostrea eversa, (*Deshayes*) *Conrad.*	Md.; Miss.

Spondylidæ.

30. Plicatula filamentosa, *Conrad.*	Ala.

Pectinidæ.

31. Pecten coosaensis, *Shumard.*	Or.
32. Pecten Deshayesii, *Lea.*	Ala.
33. Pecten propatulus, *Conrad.*	Or.
34. Pecten Spillmanni, *Gabb.*	Ala.
35. Camptoneotes calvatus, (*Morton*) *Conrad.*	S. Car.

Nuculanidæ.

36. Nuculana æqualis, *Conrad.*	Ala.
37. Nuculana bella, *Conrad.*	Ala.
38. Nuculana cælata, *Conrad.*	Ala.
39. Nuculana calcarensis, *Conrad.*	Miss.
40. Nuculana claibornensis, *Conrad.*	Ala.
41. Nuculana compsa, (*Gabb*) *Conrad.*	Tex.
42. *Nuculana cultelliformis, (*Rogers*) *Conrad.*	Va.
43. Nuculana floridana, *Conrad.*	Flor.
44. *Nuculana Gabbii, *Conrad.*	Cal.
45. *Nuculana improcera, *Conrad.*	Va.
46. Nuculana magna, (*Lea*) *Conrad.*	Ala.
47. Nuculana media, (*Lea*) *Conrad.*	Ala.
48. Nuculana opulenta, *Conrad.*	Ala.
49. *Nuculana oregona, (*Shumard*) *Conrad.*	Or.
50. Nuculana ovula, (*Lea*) *Conrad.*	Ala.
51. *Nuculana penita, *Conrad.*	Or.
52. *Nuculana parva, (*Rogers*) *Conrad.*	Va.
53. Nuculana plana, (*Lea*) *Conrad.*	Ala.
54. Nuculana plicata, (*Lea*) *Conrad.*	Ala.

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55. **Nuculana protexta,** *Conrad.* Ala.
56. **Nuculana pulcherrima,** (*Lea*) *Conrad.* Ala.
57. **Nuculana semen,** (*Lea*) *Conrad.* Ala.
58. **Nuculana subtrigona,** *Conrad.* S. Car.
59. ***Nuculana willametensis,** (*Shumard*) *Conrad.* Or.
60. ***Neilo ? abrupta,** *Conrad.* Or.
61. ***Yoldia acutifrons,** *Conrad.* Cal.
62. **Yoldia eborea,** *Conrad.* Ala.
63. ***Yoldia impressa,** *Conrad.* Or.
64. ***Yoldia nasuta,** *Gabb.* Cal.
65. ***Yoldia protexta,** *Conrad.* N. Jer.

Nuculidæ.

66. **Nucula carinifera,** *Lea.* Ala.
67. ***Nucula Conradi,** *Meek.* Or.
68. **Nucula magnifica,** *Conrad.* Ala.

Arcidæ.

69. **Axinæa idonea,** *Conrad.* Ala.
70. **Axinæa intercostata,** *Gabb.* Tex.
71. **Axinæa staminea,** *Conrad.* Ala.
72. **Axinæa trigonella,** *Conrad.* Ala.
73. ***Latiarca gigantea,** *Conrad.* Md.
74. ***Latiarca ononcheila** (*Rogers*) *Conrad.* Va.
75. ***Latiarca transversa,** (*Rogers*) *Conrad.* Va.
76. **Cucullarca cucullοides,** *Conrad.* Ala.
77. ***Anomolocardia devincta,** *Conrad.* Or.
78. **Anomolocardia rhomboidella,** (*Lea*) *Conrad.* Ala.
79. **Limopsis aviculoides,** *Conrad.* Ala.
80. **Limopsis corbuloides,** *Conrad.* Ala.
81. **Limopsis decisus,** *Conrad.* Ala.
82. **Limopsis declivus,** *Conrad.* Ala.
83. **Limopsis ellipsis,** (*Lea*) *Conrad.* Ala.
84. ***Limopsis nitens,** *Conrad.* Or.
85. ***Limopsis oregonensis,** *Conrad.* Or.
86. **Limopsis pectuncularis,** (*Lea*) *Conrad.* Ala.
87. **Limopsis perplanus,** *Conrad.* Ala.
88. **Trigonocœlia cuneus,** *Conrad.* Ala.

Trigoniidæ.

89. **Hippagus isocardioides,** *Lea.* Ala.

Aviculidæ.

90. ***Avicula annosa,** *Conrad.* N. Jer.
91. **Avicula limula,** *Conrad.* Ala.
92. ***Avicula pellucida,** *Gabb.* Cal.

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Mytilidæ.

93. **Lithophaga claibornensis,** *Conrad.* — Ala.
94. **Perna texana,** *Gabb.* — Tex.
95. ***Mytilus ? humerus,** *Conrad.* — Cal.
96. ***Stalagmium concentricum,** (*Gabb*) *Conrad.* — Cal.
97. **Stalagmium margaritaceum,** *Conrad.* — Ala.

Unionidæ.

98. **Unio Danæ,** *Meek & Hayden.* — Dak.
99. **Unio Deweyanus,** *Meek & Hayden.* — Dak.
100. **Unio Haydeni,** *Meek.* — Uta.
101. **Unio priscus,** *Meek & Hayden.* — Idaho.
102. **Unio subpatulatus,** *Meek & Hayden.* — Dak.
103. **Unio (Uniomeris) vetulus,** *Meek.* — Uta.

Crassatellidæ.

104. **Crassatella alta,** *Conrad.* — Ala.; Cal.
105. **Crassatella alæformis,** *Conrad.* — Md.; S. Car.
106. **Crassatella antestriata,** *Gabb.* — Tex.
107. ***Crassatella capricranium,** *Rogers.* — Va.
108. **Crassatella grandis,** *Gabb.* — Cal.
109. **Crassatella protexta,** *Conrad.* — Ala.
110. ***Crassatella palmula,** *Conrad.* — Md.
111. ***Crassatella uvasana,** *Conrad.* — Cal.

Astartidæ.

112. **Astarte Conradi,** *Dana.* — Ala.
113. **Astarte tellinoides,** *Conrad.* — Ala.
114. **Micromeris minutissima,** (*Lea*) *Conrad.* — Ala.
115. **Micromeris parva,** (*Lea*) *Conrad.* — Ala.
116. **Venericardia alticosta,** *Conrad.* — Ala.
117. **Venericardia ? bilineata,** *Conrad.* — S. Car.
118. ***Venericardia Blandingi,** *Conrad.* — S. Car.
119. ***Venericardia densata,** *Conrad.* — Ala.
120. ***Venericardia Hornii,** *Gabb.* — Cal.
121. **Venericardia monilicosta,** *Gabb.* — Tex.
122. **Venericardia parva,** *Lea.* — Ala.
123. ***Venericardia perantiqua,** *Conrad.* — N. Jer.
124. ***Venericardia planicosta,** *Lam.* — Va.
125. ***Venericardia regia,** *Conrad.* — Md.
126. **Venericardia rotunda,** *Lea.* — Ala.
127. **Venericardia Sillimani,** *Lea.* — Ala.
128. **Venericardia ? subquadrata,** *Conrad.* — S. Car.

Solemyidæ.

129. ***Solemya ventricosa,** *Conrad.* — Or.

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Ungulinidæ.

130. **Sphærella inflata,** (*Lea*) *Conrad.* — Ala.
131. **Sphærella levis,** *Conrad.* — Ala.
132. ***Sphærella oregona,** *Conrad.* — Or.
133. ***Mysia parilis,** *Conrad.* — Or.
134. ***Mysia polita,** *Gabb.* — Cal.

Lucinidæ.

135. ***Lucina acutilineata,** *Conrad.* — Or.
136. **Lucina carinifera,** *Conrad.* — Ala.
137. **Lucina dolabra,** *Conrad.* — Ala.
138. ***Lucina fibrosa,** *Shumard.* — Or.
139. ***Lucina gyrata,** (*Gabb*) *Conrad.* — Cal.
140. **Lucina modesta,** *Conrad.* — Ala.
141. **Lucina papyracea,** *Lea.* — Ala.
142. **Lucina pandata,** *Conrad.* — Ala.
143. **Lucina pomilia,** *Conrad.* — Ala.
144. **Lucina impressa,** *Conrad.* — Ala.
145. **Gafrarium distans,** *Conrad.* — Ala.
146. **Gafrarium liratum,** *Conrad.* — Ala.

Cardiidæ.

147. ***Çardium Brewerii,** *Gabb.* — Cal.
148. ***Cardium Cooperii,** *Gabb.* — Cal.
149. ***Cardium subtentum,** *Conrad.* — Or.
150. ***Protocardia gambrina,** *Gabb.* — Cal.
151. ***Protocardia virginiana,** *Conrad.* — Va.
152. ***Lævicardium linteum,** *Conrad.* — Cal.

Cyrenidæ.

153. **Sphærium formosum,** *Meek & Hayden.* — Dak.
154. **Sphærium planum,** *Meek & Hayden.* — Dak.
155. **Sphærium recticardinale,** *Meek & Hayden.* — Dak.
156. **Sphærium subellipticum,** *Meek & Hayden.* — Dak.
157. **Corbicula cytheriformis,** *Meek & Hayden.* — Dak.
158. **Corbicula moreauensis,** *Meek & Hayden.* — Dak.
159. **Corbicula nebrascensis,** *Meek & Hayden.* — Dak.

Cyprinidæ.

160. ***Cyprina bisecta,** *Conrad.* — Or.
161. ***Cyprinella tenuis,** *Gabb.* — Cal.

Veneridæ.

162. ***Dosiniopsis alta,** *Conrad.* — Flor.; Va.; Cal.
163. ***Dosiniopsis Meekii,** *Conrad.* — Md.
164. ***Dosiniopsis lenticularis,** (*Rogers*) *Conrad.* — Va.

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165. **Cryptogramma floridana**, *Conrad.* Flor.
166. **Cryptogramma ? penita**, *Conrad.* Flor.
167. ***Venus ? lamellifera**, *Conrad.* Or.
168. ***Venus securis**, *Shumard.* Or.
169. **Meretrix Yoakumii**, *Gabb.* Tex.
170. **Dione angustifrons**, *Conrad.* Or.
171. **Dione æquorea**, *Conrad.* Ala.
172. ***Dione brevilineata**, *Conrad.* Or.
173. ***Dione Conradiana**, *Gabb.* Cal.
174. ***Dione californiana**, *Conrad.* Cal.
175. **Dione discoidalis**, *Conrad.* Ala.
176. ***Dione eversa**, *Conrad.* Va.
177. **Dione floridana**, *Conrad.* Flor.
178. ***Dione lenis**, *Conrad.* Va.
179. ***Dione liciata**, *Conrad.* Va.
180. **Dione Mortoni**, *Conrad.* Ala.
181. **Dione Nuttalli**, *Conrad.* Ala.; Tex.
182. ***Dione oregonensis**, *Conrad.* Or.
183. ***Dione ovata**, (*Rogers*) *Conrad.* Va.
184. ***Dione perbrevis**, *Conrad.* Va.
185. **Dione perovata**, *Conrad.* Ala.
186. **Dione Pouisoni**, *Conrad.* Miss.
187. ***Dione Uvasana**, *Conrad.* Cal.
188. ***Dione varians**, *Gabb.* Cal.

Paphiidæ.

189. **Maotropsis æquorea**, *Conrad.* Ala.
190. **Maotropsis rectilinearis**, *Conrad.* Ala.

Scrobiculariidæ.

191. **Semele linosa**, *Conrad.* Ala.
192. **Abra nitens**, *Conrad.* Ala.
193. **Abra tellinula**, *Conrad.* Ala.

Donacidæ.

194. **Egeria donacia**, *Conrad.* Ala.
195. **Egeria funerata**, *Conrad.* Ala.
196. **Egeria limatula**, *Conrad.* Ala.
197. **Egeria ? nana**, *Lea.* Ala.
198. **Egeria ovalis**, *Lea.* Ala.
199. **Egeria subtrigona**, *Lea.* Ala.
200. **Egeria veneriformis**, *Lea.* Ala.

Tellinidæ.

201. ***Tellina albaria**, *Conrad.* Or.
202. **Tellina (Arcopagia) alta**, *Conrad.* Ala.
203. ***Tellina arcuata**, *Conrad.* Or.

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204. *Tellina bitruncata, *Conrad.* Or.
205. *Tellina californica, *Gabb.* Cal.
206. *Tellina emacerata, *Conrad.* Or.
207. *Tellina longa, *Gabb.* Cal.
208. *Tellina obruta, *Conrad.* Or.
209. *Tellina oregonensis, *Conrad.* Or.
210. Tellina papyria, *Conrad.* Ala.
211. Tellina perovata, *Conrad.* Ala.
212. Tellina (Peronæoderma) ovalis, *Conrad.* Ala.
213. Tellina plana, (*Lea*) *Conrad.* Ala.
214. Tellina (Arcopagia) Raveneli, *Conrad.* Ala.
215. *Tellina subnasuta, *Conrad.* Or.
216. Tellina scandula, *Conrad.* Ala.
217. Tellina Sillimani, *Conrad.* Ala.
218. Tellina (Arcopagia) subæqualis, *Conrad.* S. Car.
219. Gari filosa, *Conrad.* Ala.
220. *Gari ? texta, *Gabb.* Cal.

Mactridæ.

221. *Mactra albaria, *Conrad.* Or.
222. Mactra decisa, *Conrad.* Ala.
223. Mactra parilis, *Conrad.* Ala.
224. Mactrella prætenuis, *Conrad.* Ala.
225. Pteropsis papyria, *Conrad.* Ala.
226. Pteropsis lapidosa, *Conrad.* S. Car.

Anatinidæ.

227. Periploma clairbornensis, (*Lea*) *Conrad.* Ala.
228. *Thracia trapezoides, *Conrad.* Or.
229. *Pholadomya marylandica, *Conrad.* Md.

Corbulidæ.

230. Corbula (Potamomya) mactriformis, *Meek & Hayden.* Mo.
231. Corbula nasuta, *Conrad.* Ala.
232. Corbula oniscus, *Conrad.* Ala.
233. *Corbula parilis, *Gabb.* Cal.
234. Corbula perundata, *Meek & Hayden.* Mo.
235. Corbula texana, *Gabb.* Tex.
236. *Neæra dolabriformis, *Gabb.* Cal.

Saxicavidæ.

237. *Glycimeris abrupta, *Conrad.* Or.
238. *Glycimeris elongata, *Conrad.* Md.

Solenidæ.

239. *Plectosolen curtus, *Conrad.* Or.
240. *Plectosolen ? diegoensis, (*Gabb.*) *Conrad.* Cal.

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241. *Plectosolen parallelus, (*Gabb.*) *Conrad.* Cal.
242. *Plectosolen protextus, *Conrad.* Or.

Pholadidæ.

243. *Pholas petrosa, *Conrad.* Md.
244. Teredo simplex, *Lea.* Ala.

Gastrochænidæ.

245. Gastrochæna larva, *Conrad.* Ala.

Class GASTEROPODA.

Order TECTIBRANCHIATA.

Cylichnidæ.

246. Cylichna Dekayi, (*Lea*) *Conrad.* Ala.
247. Cylichna galba, *Conrad.* Ala.
248. Cylichna Kelloggii, *Gabb.* Tex.
249. *Cylichna oregonensis, *Conrad.* Or.
250. *Cylichna petrosa, *Conrad.* Or.
251. Volvula Conradiana, *Gabb.* Tex.
252. Volvula minutissima, *Gabb.* Tex.

Actæonidæ.

253. Actæon costellatus, *Conrad.* Ala.
254. Actæon idoneus, *Conrad.* Ala.
255. Actæon pomilius, *Conrad.* Ala.
256. Actæon punctatus, *Lea.* Ala.
257. Actæon subvaricatus, *Conrad.* Ala.
258. *Tornatellæa bella, *Conrad.* Ala.
259. *Tornatellæa impressa, (*Gabb*) *Conrad.* Cal.
260. Tornatellæa lata, *Conrad.* Ala.
261. Cinulia Matthewsonii, *Gabb.* Cal.
262. Actæonema striata, (*Lea*) *Conrad.* Ala.
263. *Actæonema prisca, *Conrad.* N. Jer.
264. Actædnema sulcata, (*Lea*) *Conrad.* Ala.
265. Ringicula biplicata, (*Lea*) *Conrad.* Ala.

Subclass PULMONIFERA.

Limnæidæ.

266. Limnæa nitidula, *Meek.* Uta.
267. Limnæa similis, *Meek.* Uta.
268. Limnæa (Pleurolimnæa) tenuicostata, *Meek & Hayden.* Dak.
269. Limnæa vetusta, *Meek.* Uta.
270. Physa rhomboidea, *Meek & Hayden.* Uta.
271. Aplexa longiuscula, *Meek & Hayden.* Dak.

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272. **Aplexa subelongata,** *Meek & Hayden.* Dak.
273. **Planorbis convolutus,** *Meek.* Uta.
274. **Planorbis planiconvexus,** *Meek & Hayden.* Ida.
275. **Planorbis spectabilis,** *Meek.* Uta.
276. **Planorbis utahensis,** *Meek & Hayden.* Uta.

Ancylidæ.

277. **Ancylus minutulus,** *Meek & Hayden.* Dak.

Auriculidæ.

278. **Melampus priscus,** *Meek.* Uta.

Helicidæ.

279. **Bulimus floridanus,** *Conrad.* Flor.
280. **Spiraxis Haydeni,** *Meek.* Dak.
281. **Helix? obliqua,** *Meek & Hayden.* Idaho.
282. **Helix veterna,** *Meek.* Uta.
283. **Helix? vetusta,** *Meek & Hayden.* Idaho.
284. **Polygyra amplexa,** *Meek & Hayden.* Idaho.
285. **Macrocyclis spatiosa,** (*Meek & Hayden*) *Meek.* Uta.
286. **Helicella occidentalis,** *Meek & Hayden.* Idaho.
287. **Helicella Evansi,** *Meek & Hayden.* Idaho.
288. **Clausilia contraria,** (*Meek & Hayden*) *Meek.* Dak.
289. **Clausilia teres,** (*Meek & Hayden*) *Meek.* Dak.
290. **Clausilia vermicula,** (*Meek & Hayden*) *Meek.* Dak.

Order CYCLOBRANCHIATA.

Dentaliidæ.

291. ***Dentalium Cooperii,** *Gabb.* Cal.
292. **Dentalium minutistriatum,** *Gabb.* Tex.
293. **Dentalium thalloides,** *Conrad.* Ala.
294. **Dentalium turritum,** *Lea.* Ala.
295. **Dentalium substriatum,** *Conrad.* Or.
296. ***Gadus pusillus,** (*Gabb*) *Conrad.* Cal.
297. **Gadus subcoarctatus,** (*Gabb*) *Conrad.* Tex.

Chitonidæ.

298. **Chiton antiquus,** *Conrad.* Ala.
299. **Chiton eocenensis,** *Conrad.* Ala.

Order RHIPIDOGLOSSATA.

Fissurellidæ.

300. **Emarginula arata,** *Conrad.* Ala.
301. ***Emarginula radiata,** *Gabb.* Cal.
302. **Fissurella tenebrosa,** *Conrad.* Ala.

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Rotellidæ.

303. **Umbonium nanus,** (*Lea*) *Conrad.* — Ala.

Trochidæ.

304. **Planaria nitens,** *Lea.* — Ala.
305. ***Monodonta glandula,** *Conrad.* — Md.

Order CTENOBRANCHIATA.

Vanikoridæ.

306. ***Vanikoro diegoana,** (*Conrad*) *Meek.* — Cal.

Capulidæ.

307. **Concholepas pygmæa,** (*Lea*) *Conrad.* — Ala.

Calyptræidæ.

308. **Trochita trochiformis,** (*Lea*) *Conrad.* — Ala.
309. ***Spirocrypta pileum,** *Gabb.* — Cal.
310. **Crypta dumosa,** *Conrad.* — Ala.
311. ***Crypta prærupta,** *Conrad.* — Or.
312. **Crypta lirata,** *Conrad.* — Ala.
313. ***Crypta rostralis,** *Conrad.* — Or.
314. ***Galeropsis excentricus,** (*Gabb*) *Conrad.* — Cal.

Onustidæ.

315. **Onustus extensus?** *Sowerby.* — N. Jer.
316. **Onustus humilis,** *Conrad.* — Ala.

Vermetidæ.

317. **Tenegoda vitis,** *Conrad.* — Ala.

Turritellidæ.

318. **Turritella cælatura,** *Conrad.* — S. Car.
319. **Turritella carinata,** *Lea.* — Ala.
320. ***Turritella humerosa,** *Conrad.* — Md.
321. ***Turritella Mortoni,** *Conrad.* — Ala.
322. **Turritella nasuta,** *Gabb.* — Tex.
323. ***Turritella perdita,** *Conrad.* — Or.
324. **Turritella præcincta,** *Conrad.* — Ala.
325. ***Turritella uvasana,** *Conrad.* — Cal.
326. ***Mesalia arenicola,** *Conrad.* — Or.
327. **Mesalia lintea,** *Conrad.* — Ala.
328. **Mesalia obruta,** *Conrad.* — Ala.
329. **Mesalia striata,** (*Lea*) *Conrad.* — Ala.
330. **Mesalia venusta,** *Conrad.* — Ala.

Valvatidæ.

331. **Valvata parvula,** *Meek & Hayden.* — Dak.
332. **Valvata subumbilicata,** *Meek & Hayden.* — Dak.

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Viviparidæ.

333.	**Viviparus Conradi,** *Meek & Hayden.*	Dak.
334.	**Viviparus Leai,** *Meek & Hayden.*	Dak.
335.	**Viviparus Leidyi,** *Meek & Hayden.*	Dak.
336.	**Viviparus Lyelli,** *Conrad.*	N. Car.
337.	**Viviparus Raynoldsanus,** *Meek & Hayden.*	Dak.
338.	**Viviparus retusus,** *Meek & Hayden.*	Dak.
339.	**Viviparus trochiformis,** *Meek & Hayden.*	Dak.
340.	**Campeloma multistriatum,** (*Meek & Hayden*) *Meek.*	Dak.
341.	**Campeloma multilineatum,** (*Meek & Hayden*) *Meek.*	Dak.
342.	**Campeloma vetulum,** (*Meek & Hayden*) *Meek.*	Dak.

Rissoidæ.

343.	**Hydrobia Anthonii,** *Meek & Hayden.*	Dak.
344.	**Micropyrgus minutulus,** *Meek & Hayden.*	Dak.

Lacunidæ.

345.	**Lacunaria alabamiensis,** (*Whitfield*) *Conrad.*	Ala.
346.	**Lacunaria erecta,** (*Whitfield*) *Conrad.*	Ala.

Melaniidæ.

347.	**Tiara humerosa,** *Meek.*	Uta.
348.	**Melania convexa,** *Meek & Hayden.*	Uta.
349.	**Melania inornata,** *Meek & Hayden.*	Dak.
350.	**Melania nebrascensis,** *Meek & Hayden.*	Dak.

Strepomatidæ.

351.	**Goniobasis ? nodulosa,** (*Hall*) *Meek.*	Uta.
352.	**Goniobasis ? arota,** *Meek.*	Dak.
353.	**Goniobasis ? Fremontii,** (*Hall*) *Meek.*	Uta.
354.	**Goniobasis ? Simpsoni,** *Meek.*	Uta.
355.	**Goniobasis ? sublævis,** (*Meek & Hayden*) *Meek.*	Dak.
356.	**Goniobasis ? subtortuosa,** (*Meek & Hayden*) *Meek.*	Ida.
357.	**Goniobasis ? tenuicarinata,** (*Meek & Hayden*) *Meek.*	Dak.
358.	**Goniobasis ? tenera,** (*Hall*) *Meek.*	Uta.

Cerithiidæ.

359.	**Cerithidea (Pirenella) nebrascensis,** *Meek & Hayden.*	Dak.
360.	**Cerithium claibornense,** *Conrad.*	Ala.
361.	**Vertagus georgianus,** *Lyell & Sowerby.*	Ga.
362.	**Cerithium silicoum,** *Conrad.*	S. Car.
363.	**Cerithium vinctum,** *Whitfield.*	Ala.

Cancellaridæ.

364.	**Cancellaria alveata,** *Conrad.*	Ala.
365.	**Cancellaria babylonica,** *Lea.*	Ala.
366.	**Cancellaria elevata,** *Lea.*	Ala.
367.	**Cancellaria ellapsa,** *Conrad.*	Tex.

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368. **Cancellaria gemmata,** *Conrad.* Ala.
369. **Cancellaria impressa,** *Conrad.* Ala.
370. **Cancellaria lirata,** *Conrad.* Tex.?
371. **Cancellaria multiplicata,** *Lea.* Ala.
372. ***Cancellaria oregonensis,** *Conrad.* Or.
373. **Cancellaria parva,** *Lea.* Ala.
374. **Cancellaria plicata,** *Lea.* Ala.
375. **Cancellaria tessellata,** *Lea.* Ala.
376. **Cancellaria tortiplica,** *Conrad.* Tex.

Strombidæ.

377. **Calyptrophorus trinodiferus,** *Conrad.* Ala.
378. ***Calyptrophorus velatus,** *Conrad.* Ala.
379. ***Rimella canalifera,** *Gabb.* Cal.
380. **Rimella laqueata,** *Conrad.* Ala.
381. ***Leiorhynus californicus,** *Conrad.* Cal.
382. **Leiorhynus prorutus,** *Conrad.* Ala.
383. ***Hippochrenes columbaria?** *Defrance.* N. Jer.

Conidæ.

384. ***Conus Hornii,** *Gabb.* Cal.
385. ***Conus Remondii,** *Gabb.* Cal.
386. **Conus sauridens,** *Conrad.* Ala.
387. **Conus subsauridens,** *Conrad.* Ala.?

Pleurotomariidæ.

388. ***Pleurotomaria perlata,** *Conrad.* N. Jer.

Architectonicidæ.

389. **Architectonica alveata,** *Conrad.* Ala.
390. **Architectonica amœna,** *Conrad.* Ala.
391. **Architectonica antrosa,** *Conrad.* Ala.
392. **Architectonica cancellata,** *Conrad.* Ala.
393. ***Architectonica cognata,** *Gabb.* Cal.
394. **Architectonica elaborata,** *Conrad.* Ala.
395. **Architectonica exacuua,** *Conrad.* Ala.
396. **Architectonica fungina,** *Conrad.* Ala.
397. **Architectonica Henrici,** (*Lea*) *Conrad.* Ala.
398. ***Architectonica Hornii,** *Gabb.* Cal.
399. **Architectonica Meekana,** *Gabb.* Tex.
400. **Architectonica ornata,** (*Lea*) *Conrad.* Ala.
401. **Architectonica plana,** (*Lea*) *Conrad.* Ala.
402. **Architectonica pseudogranulata,** (*D'Orbigny*) *Conrad.* Ala.
403. **Architectonica scrobiculata,** *Conrad.* Ala.
404. **Architectonica stalagmium,** *Conrad.* Ala.
405. **Architectonica texana,** *Gabb.* Tex.
406. **Architectonica vespertina,** *Gabb.* Tex.
407. **Solariorbis depressus,** (*Lea*) *Conrad.* Ala.

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408. **Solariorbis bellus,** *Conrad.* Ala.
409. **Solariorbis lineatus,** (*Lea*) *Conrad.* Ala.
410. **Solariorbis nitens,** (*Lea*) *Conrad.* Ala.
411. **Orbis rotella,** *Lea.* Ala.

Cerithiopsidæ.?

412. **Cerithopsis ? alternata,** *Gabb.* Cal.
413. **Cleidomera ? bicostellata,** *Conrad.* S. Car.
414. **Cleidomera claibornense,** *Conrad.* Ala.
415. ***Cleidomera nassula,** *Conrad.* Ala.
416. **Cleidomera solitaria,** *Conrad.* Ala.
417. ***Mathilda ? oregonensis,** *Conrad.* Or.
418. ***Cerithioderma prima,** *Conrad.* Ala.

Eulimidæ.

419. **Eulima aciculata,** (*Lea*) *Conrad.* Ala.
420. **Eulima (Pasithea) claibornensis,** *Lea.* Ala.
421. **Eulima exilis,** *Gabb.* Tex.
422. **Eulima (Pasithea) guttula,** *Lea.* Ala.
423. **Eulima lugubris,** (*Lea*) *Conrad.* Ala.
424. **Eulima notata,** (*Lea*) *Conrad.* Ala.
425. **Eulima tenua,** *Gabb.* Tex.
426. **Eulima texana,** *Gabb.* Tex.
427. **Eulima secale,** (*Lea*) *Conrad.* Ala.
428. **Niso umbilicata,** *Conrad.* Ala.
429. ***Niso polita,** *Gabb.* Cal.

Pyramidellidæ.

430. **Obeliscus larvatus,** *Conrad.* Ala.
431. **Obeliscus melanellus,** (*Lea*) *Conrad.* Ala.
432. **Obeliscus perexilis,** *Conrad.* Ala.
433. **Obeliscus pygmæus,** (*Lea*) *Conrad.* Ala.
434. **Obeliscus striatus,** (*Lea*) *Conrad.* Ala.

Terebridæ.

435. **Terebra venusta,** *Lea.* Ala.
436. **Terebrifusus amœnus,** *Conrad.* Ala.
437. **Pyramimitra costata,** (*Lea*) *Conrad.* Ala.
438. **Pyramimitra terebriformis,** *Conrad.* Ala.

Scalaridæ.

439. **Scala dormitor,** *Conrad.* Ala.
440. **Scala lintea,** *Conrad.* Ala.
441. **Scala quinquefasciata,** *Lea.* Ala.
442. **Scala planulata,** *Lea.* Ala.
443. **Scala (Scalina) staminea,** *Conrad.* Ala.
444. **Scala (Opalia) sessilis,** *Conrad.* Ala.

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445. **Cirsostrema claibornensis,** *Conrad.* Ala.
446. **Cirsostrema ? nassula,** *Conrad.* Ala.
447. ***Compsopleura trinodosa,** *Conrad.* Ala.

Naticidæ.

448. **Natica magno-umbilicata,** *Lea.* Ala.
449. **Natica minima,** *Lea.* Ala.
450. **Natica minor,** *Lea.* Ala.
451. **Lunatia eminula,** *Conrad.* Ala.
452. ***Lunatia marylandica,** *Conrad.* Ala.
453. **Lunatia minima,** (*Lea*) *Conrad.* Ala.
454. **Lunatia Moorei,** *Gabb.* Tex.
455. ***Lunatia ? nuciformis,** *Gabb.* Cal.
456. ***Lunatia oregonensis,** *Conrad.* Or.
457. **Lunatia semilunata,** *Lea.* Ala.
458. ***Lunatia Shumardiana,** *Gabb.* Cal.
459. ***Ampullina alveata,** *Conrad.* Cal.
460. **Neverita ostites,** *Conrad.* Ala.
461. **Neverita arata,** *Gabb.* Tex.
462. **Neverita gibbosa,** (*Lea*) *Conrad.* Ala.
463. **Neverita limula,** *Conrad.* Ala.
464. ***Neverita saxea,** *Conrad.* Or.
465. **Lupia perovata,** *Conrad.* Ala.
466. **Catinus arctatus,** *Conrad.* Ala.
467. **Catinus bilix,** *Conrad.* Ala.
468. **Catinus declivis,** *Conrad.* Ala.
469. ***Catinus scopulosus,** *Conrad.* Or.
470. ***Catinus obliquus,** (*Gabb*) *Conrad.* Cal.

Cassidæ.

471. ***Galodea petrosa,** *Conrad.* Or.
472. ***Semicassis ? biliratus,** *Conrad.* Or.
473. **Semicassis brevicostatus,** *Conrad.* Ala.
474. ***Semicassis ? petrosus,** *Conrad.* Or.
475. **Semicassis nuperus,** *Conrad.* Ala.
476. **Semicassis Sowerbii,** (*Lea*) *Conrad.* Ala.

Sycotopidæ.

477. ***Perissolax Gabbii,** *Conrad.* Cal.
478. ***Ficopsis Cooperii,** (*Gabb*) *Conrad.* Cal.
479. ***Ficopsis modestus,** *Conrad.* Or.
480. ***Ficopsis mammillatus,** (*Gabb*) *Conrad.* Cal.
481. ***Ficopsis penitus,** *Conrad.* Ala.
482. ***Ficopsis Remondii,** (*Gabb*) *Conrad.* Cal.
483. ***Priscofícus Hornii,** (*Gabb*) *Conrad.* Cal.

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484. *Priscofusus oregonensis, *Conrad.* — Or.
485. *Priscofusus Smithii ? (*Sowerby*) *Conrad.* — N. Jer.

Marginellidæ.

486. Marginella crassilabra, *Conrad.* — Ala.
487. Marginella constricta, *Conrad.* — Ala.
488. Marginella humerosa, *Conrad.* — Ala.
489. Volutella larvata, *Conrad.* — Ala.

Volutidæ.

490. *Volutilithes californianus, *Conrad.* — Cal.
491. Volutilithes impressus, *Conrad.* — Tex.
492. Volutilithes indentus, *Conrad.* — Tex.
493. *Volutilithes induratus, *Conrad.* — Or.
494. Volutilithes limopsis, *Conrad.* — Ala.
495. *Volutilithes mutatus ? *Deshayes.* — N. Jer.
496. Volutilithes petrosus, *Conrad.* — Ala.
497. Volutilithes rugatus, *Conrad.* — Ala.
498. Volutilithes Sayanus, *Conrad.* — Ala.; Tex.
499. Volutilithes symmetricus, *Conrad.* — Miss.
500. Volutilithes (Athleta) Tuomeyi, *Conrad.* — Ala.
501. Caricella bolaris, *Conrad.* — Ala.
502. Caricella demissa, *Conrad.* — Ala.
503. Caricella doliata, *Conrad.* — Ala.
504. Caricella Flemingii, (*Lea*) *Conrad.* — Ala.
505. Caricella prætenuis, *Conrad.* — Ala.
506. Caricella pyruloides, *Conrad.* — Ala.
507. Otocheilus nereidis, *Conrad.* — Ala.

Mitridæ.

508. Conomitra fusoides, (*Lea*) *Conrad.* — Ala.
509. Lapparia dumosa, *Conrad.* — Ala.
510. Lapparia Mooreana, (*Gabb*) *Conrad.* — Tex.
511. Lapparia pactylis, *Conrad.* — Ala.
512. Mitra (Callithea) exilis, *Gabb.* — Tex.
513. Fusimitra ? lineata, (*Lea*) *Conrad.* — Ala.
514. Fusimitra ? minima, (*Lea*) *Conrad.* — Ala.
515. Fusimitra ? perexilis, *Conrad.* — Ala.

Fasciolariidæ.

516. *Fasciolaria ? io, *Gabb.* — Cal.
517. Fasciolaria ? elevata, *Lea.* — Ala.
518. *Fasciolaria ? sinuata, *Gabb.* — Cal.
519. *Fasciolaria læviuscula, *Gabb.* — Cal.
520. Cordieria gracilis, *Conrad.* — Ala.
521. Cordieria Moorei, (*Gabb*) *Conrad.* — Tex.
522. Latirus (Peristernia) plicatus, (*Lea*) *Conrad.* — Ala.

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Dactylidæ.

523. **Lamprodoma alabamensis,** *Conrad.*	Ala.
524. **Lamprodoma bombylis,** *Conrad.*	Ala.
525. ***Lamprodoma elongata,** (*Gabb*) *Conrad.*	Cal.
526. **Lamprodoma gracilis,** (*Lea*) *Conrad.*	Ala.
527. **Lamprodoma Phillipsii,** (*Lea*) *Conrad.*	Ala.
528. **Ancillopsis altile,** *Conrad.*	Ala.
529. **Ancillopsis scamba,** *Conrad.*	Ala.
530. **Ancillopsis subglobosa,** *Conrad.*	Ala.
531. **Ancillopsis tenera,** *Conrad.*	Ala.
532. **Tortoliva texana,** *Conrad.*	Tex.
533. **Olivula ? plicata,** (*Lea*) *Conrad.*	Ala.
534. **Olivula punctulifera,** (*Gabb*) *Conrad.*	Tex.
535. **Olivula staminea,** *Conrad.*	Ala.
536. **Monoptygma alabamiensis,** *Lea.*	Ala.
537. **Monoptygma crassiplica,** *Conrad.*	Tex.
538. **Monoptygma curta,** *Conrad.*	Ala.
539. **Monoptygma lymneoides,** *Conrad.*	Ala.

Purpuridæ.

540. **Lacinia alveata,** *Conrad.*	Ala.
541. **Cornulina armigera,** *Conrad.*	Ala.
542. **Pseudoliva (Buccinorbis) carinata,** *Conrad.*	Ala.
543. **Pseudoliva (Buccinorbis) filiformis,** *Conrad.*	Tex.
544. ***Pseudoliva lineata,** *Gabb.*	Cal.
545. **Pseudoliva linosa,** *Conrad.*	Tex.
546. **Pseudoliva sulcata,** (*Lea*) *Conrad.*	Ala.
547. **Pseudoliva (Buccinorbis) tuberculifera,** *Conrad.*	Ala.
548. **Pseudoliva (Buccinorbis) vetusta,** *Conrad.*	Ala.
549. ***Pseudoliva volutæformis,** *Gabb.*	Cal.

Buccinidæ.

550. **Lævibuccinum prorsum,** *Conrad.*	Ala.
551. ***Buccinofusus diegoensis,** (*Gabb*) *Conrad.*	Cal.
552. ***Nassa ? cretacea,** *Gabb.*	Cal.

Tritoniidæ.

553. **Simpulum exile,** *Conrad.*	Ala.
554. **Simpulum otopse,** *Conrad.*	Ala.
555. **Simpulum Showalteri,** *Conrad.*	Ala.
556. **Buccitriton altum,** *Conrad.*	Tex.
557. **Buccitriton sagena,** *Conrad.*	Ala.
558. **Buccitriton texanum,** *Conrad.*	Ala.
559. **Distorsio (Personella) septemdentatus,** *Gabb.*	Tex.
560. **Ranellina Maclurii,** *Conrad.*	Ala.

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561. **Sagenella bellilirata**, *Conrad.* — Ala.
562. **Sagenella texana**, *Conrad.* — Tex.

Pleurotomidæ.

563. **Surcula acutirostra**, *Conrad.* — Ala.
564. **Surcula annosa**, *Conrad.* — N. Jer.
565. **Surcula alternata**, *Conrad.* — Ala.
566. **Surcula Beaumontii**, (*Lea*) *Conrad.* — Ala.
567. **Surcula biseriata**, *Conrad.* — Ala.
568. ***Surcula Claytonensis**, *Gabb.* — Cal.
569. **Surcula cælata**, (*Lea*) *Conrad.* — Ala.
570. **Surcula Childreni**, (*Lea*) *Conrad* — Ala.
571. **Surcula depygis**, *Conrad.* — Ala.
572. **Surcula Desnoyersii**, (*Lea*) *Conrad.* — Ala.
573. **Surcula Gabbii**, *Conrad.* — Tex.
574. **Surcula gemmata**, *Conrad.* — Ala.
575. **Surcula Kellogii**, (*Gabb*) *Conrad.* — Tex.
576. **Surcula lintea**, *Conrad.* — Tex.
577. **Surcula lirata**, *Conrad.* — Ala.
578. **Surcula monilifera**, (*Lea*) *Conrad.* — Ala.
579. **Surcula nodo-carinata**, (*Gabb*) *Conrad.* — Tex.
580. **Surcula nupera**, *Conrad.* — Ala.
581. **Surcula obliqua**, (*Lea*) *Conrad.* — Ala.
582. **Surcula rugosa**, (*Lea*) *Conrad.* — Ala.
583. **Surcula rugatina**, *Conrad.* — Ala.
584. **Surcula Sayi**, (*Lea*) *Conrad.* — Ala.
585. **Surcula subæqualis**, *Conrad.* — Ala.
586. **Surcula tabulata**, *Conrad.* — Ala.
587. **Surcula texana**, *Conrad.* — Tex.
588. **Surcula varicostata**, (*Gabb*) *Conrad.* — Cal.
589. **Drillia lævis**, *Conrad.* — Ala.
590. **Drillia Lonsdalii**, (*Lea*) *Conrad.* — Tex.
591. **Drillia texana**, (*Gabb*) *Conrad.* — Tex.
592. **Moniliopsis elaborata**, *Conrad.* — Ala.
593. **Cochlospira engonata**, *Conrad.* — Ala.; Tex.
594. **Conorbis conoides**, *Conrad.* — Ala.
595. **Exilia pergracilis**, *Conrad.* — Tex.
596. **Euchelodon reticulata**, *Gabb.* — Tex.
597. **Scobinella ? crassiplicata**, *Gabb.* — Tex.
598. **Scobinella ? læviplicata**, *Gabb.* — Tex.

Muricidæ.

599. **Murex engonatus**, *Conrad.* — Ala.
600. **Murex Mantelli**, *Conrad.* — Ala.
601. **Murex morulus**, *Conrad.* — Ala.
602. **Murex septenarius**, *Conrad.* — Ala.

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603. **Murex Vanuxemi**, *Conrad.* Ala.
604. **Typhis gracilis**, *Conrad.* Ala.
605. **Typhis antiquus**, *Gabb.* Cal.
606. **Odontoplys compsorhytis**, *Gabb.* Tex.
607. ***Fusus diaboli**, *Gabb.* Cal.
608. ***Fusus Martinez**, *Gabb.* Cal.
609. ***Fusus Matthewsonii**, *Gabb* Cal.
610. **Papillina papillatus**, *Conrad.* Ala.
611. **Clavifusus altile**, *Conrad.* Ala.
612. **Clavifusus Cooperi**, *Conrad.* Ala.
613. **Strepsidura Conybearii**, (*Lea*) *Conrad.* Ala.
614. **Strepsidura bella**, *Conrad.* Ala.
615. **Strepsidura limula**, *Conrad.* Ala.
616. **Strepsidura lintea**, *Conrad.* Ala.
617. **Strepsidura lirata**, *Conrad.* Ala.
618. **Strepsidura perlata**, *Conrad.* Ala.
619. ***Neptunea ? gracilis**, *Gabb.* Cal.
620. **Neptunea irrasa**, *Conrad.* Ala.
621. **Neptunea Mortonii**, (*Lea*) *Conrad.* Ala.
622. **Neptunea submortonii**, (*Gabb*) *Conrad.* Ala.
623. ***Whitnea ficus**, *Gabb.* Cal.
624. **Bulbifusus inauratus**, *Conrad.* Ala.
625. **Turrispira protexta**, *Conrad.* Ala.
626. **Turrispira salebrosa**, *Conrad.* Ala.
627. **Lirofusus thoracicus**, *Conrad.* Ala.
628. **Levifusus Blakei**, *Conrad.* Cal.
629. **Levifusus trabeatus**, *Conrad.* Ala.
630. **Clavella raphanoides**, *Conrad.* Ala.
631. **Clavella pachyleurus**, *Conrad.* Ala.
632. ***Exilifusus thalloides**, *Conrad.* Ala.
633. ***Priscofusus corpulentus**, *Conrad.* Or.
634. **Priscofusus devinctus**, *Conrad.* Or.
635. **Priscofusus geniculus**, *Conrad.* Or.
636. **Priscofusus medialis**, *Conrad.* Or.
637. **Priscofusus nodiferus**, *Conrad.* Or.
638. **Priscofusus oregonensis**, *Conrad.* Or.

Class **CEPHALOPODA.**

Order **TECTIBRANCHIATA.**

Nautilidæ.

639. ***Aturia vanuxemi**, *Conrad.* N. Jer.
640. ***Cymomia Lamarckii**, (*Deshayes,*) *Conrad.* N. Jer.
641. **Belosepia ungula**, *Gabb.* Tex.

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SUBKINGDOM **ARTICULATA**

CLASS **ANNULATA.**

Order **TUBICOLA.**

Serpulidæ.

642. **Serpula ornata,** *Lea.* Ala.
643. **Serpula squamulosa,** *Conrad.* Ala.

CLASS **CRUSTACEA.**

ORDER **CIRRIPEDIA.**

Balanidæ.

644. **Balanus humilis,** *Conrad.* Flor.
645. **Balanus peregrinus,** *Conrad.* S. Car.

2. SHELL BLUFF GROUP

SUBKINGDOM **MOLLUSCA.**

CLASS **LAMELLIBRANCHIATA**

Ostreidæ.

646. **Ostrea georgiana,** *Conrad.* Ga.; Miss.

Corbulidæ.

647. **Corbula aliformis,** *Conrad.* Miss.

CLASS **GASTEROPODA.**

Muricidæ.

648. **Piestocheilus vicksburgensis,** (*Conrad*) *Meek* Miss.

Tritoniidæ.

649. **Tritonopsis subalveatum,** *Conrad.* Miss.

Naticidæ.

650. **Ampullinopsis mississippiensis,** *Conrad.* Miss.

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3. UPPER EOCENE OR JACKSON GROUP.

Subkingdom PROTOZOA.

Class RHIZOPODA.

Order FORAMINIFERA.

Cyclostigidæ.

651. **Orbitolites (Orbitoides) Mantelli**, *Morton.* — Miss.; Ala.

Multiloculidæ.

652. **Triloculina lineata**, *Conrad.* — Miss.

Subkingdom RADIATA.

Class POLYPI.

Order ACTINARIA.

Turbinolidæ.

653. **Flabellum Wailesii**, *Conrad.* — Miss.

Astræidæ.

654. **Osteodes irroratus**, *Conrad.* — Miss.

Madreporidæ.

655. **Endopachys expansum**, *Conrad.* — Miss.

Class ECHINODERMATA.

Order ECHINOIDEA.

Scutellidæ.

656. **Mortonia (Periarchus)**[1] **altus**, *Conrad.* — N. Car.
657. **Mortonia (Periarchus) carolinensis**, *Conrad.* — S. Car.
658. **Mortonia (Periarchus) crustuloides**, (*Morton*) *Conrad.* — S. Car.
659. **Mortonia (Periarchus) marginalis**, *Conrad.* — S. Car.
660. **Mortonia (Periarchus) pileus-sinensis**, (*Ravenel*) *Conrad.* — S. Car.
661. **Mortonia (Periarchus) planus**, *Conrad.* — S. Car.

[1] Subgenus Periarchus, *Conrad. Description.*—Rounded; apex central; ambulacra short, open at the ends which are situated about half way between the apex and margin; ambulacral space tumid; margin and submargin thin; anus nearer to the mouth than to the periphery. The typical species of Mortonia (*Scutella quinquefaria*, Say) is much thicker on the edge, and the anus is situated rather nearer to the periphery than to the mouth.

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Cidaridæ.

662. **Cœlopleurus depressus,** *Conrad,* n. s. — S. Car.
663. **Cœlopleurus infulatus,** (*Morton*) *Desor.* — S. Car.

Clypeasteridæ.

664. **Clypeaster Jonesii,** (*Forbes*) *Desor.* — Ga.
665. **Clypeaster Rogersi,** (*Morton*) *Conrad.* — Ala.
666. **Clypeaster tumidus,** *Conrad.* — Miss.

Cassidulidæ.

667. **Echinianthus Mortonis,** (*Mich.*) *Desor.* — Miss.
668. **Cassidulus amygdala,** *Desor.*
669. **Cassidulus Conradi,** *Couper.* . — Ga.
670. **Cassidulus patelliformis,** (*Bouvé*) *Desor.* — Ga.
671. **Hemiaster Conradi,** *Bouvé.* — Ga.
672. **Discoidea Haldemani,** *Conrad.* — Ga.
673. **Pyrgorhyncus Gouldii,** *Bouvé.* — Ga.

Subkingdom **MOLLUSCA.**

Class **POLYZOA.**

Escharidæ.

674. **Eschara tubulata,** (*Lonsdale*) *Gabb & Horn.* — N. Car.
675. **Eschara petiolus,** *Lonsdale.* — S. Car.
676. **Eschara incumbens,** *Lonsdale.* — S. Car.
677. **Eschara viminea,** *Lonsdale.* — S. Car.
678. **Eschara texta,** *Gabb & Horn.* — S. Car.
679. **Eschara ovalis,** *Gabb & Horn.* — Ala.
680. **Lunulites distans,** *Lonsdale.* — Ala.
681. **Lunulites sexangulata,** *Lonsdale.* — N. Car.
682. **Lunulites contigua,** *Lonsdale.* — N. Car.
683. **Semieschara tubulata,** *Gabb & Horn.* — Ala. ?
684. **Cellepora cycloris,** *Gabb & Horn.* — Ala.
685. **Cellepora inornata,** *Gabb & Horn.* — Ala.
686. **Escharella micropora,** *Gabb & Horn.* — Ala.
687. **Reptescharella carolinensis,** *Gabb & Horn.* — S. Car.

Fasciporidæ.

688. **Idmonea maxillaris,** *Lonsdale.* — S. Car.

Sparsidæ.

689. **Entalophora proboscidioides,** *Gabb & Horn.* — Ala. ?

Class **BRACHIOPODA.**

Terebratulidæ.

690. **Terebratulina lachryma,** (*Morton*) *Conrad.* — S. Car.; Ala.
691. **Terebratula canipes,** *Ravenel.* — S. Car.

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Class LAMELLIBRANCHIATA.

Anomiidæ.

692. **Anomia jugosa,** *Conrad.* — S. Car.

Ostreidæ.

693. **Ostrea falciformis,** *Conrad.* — Miss.
694. **Ostrea trigonalis,** *Conrad.* — Miss.
695. **Ostrea Tuomeyi,** *Conrad.* — Miss.

Spondylidæ.

696. **Spondylus dumosus,** (*Morton*) *Conrad.* — Ala.

Pectinidæ.

697. **Pecten anatipes,** *Morton.* — Ala.
698. **Pecten membranosus,** *Morton.* — S. Car.
699. **Pecten nuperus,** *Conrad.* — Miss.
700. **Camptonectes claibornensis,** *Conrad.* — Ala.
701. **Camptonectes scintillatus,** *Conrad.* — Miss.
702. **Janira elixata,** *Conrad.* — Miss.
703. **Janira Poulsoni,** *Conrad.* — Ala.

Nuculanidæ.

704. **Nuculana linifera,** *Conrad.* — Miss.
705. **Nuculana multilineata,** *Conrad.* — Miss.

Nuculidæ.

706. **Nucula spheniopsis,** *Conrad.* — Miss.

Arcidæ.

707. **Barbatia (Calliarca) aspera,** *Conrad.* — Miss.
708. **Axinæa inequistria,** *Conrad.* — Miss.
709. **Axinæa duplistria,** *Conrad.* — Miss.
710. **Axinæa filosa,** *Conrad.* — Miss.

Aviculidæ.

711. **Pinna argentea,** *Conrad.* — Miss.

Mytilidæ.

712. **Perna cretacea,** (*Morton*) *Conrad.* — Ala.
713. **Arcoperna filosa,** *Conrad.* — Miss.

Crassatellidæ.

714. **Crassatella flexura,** *Conrad* — Miss.
715. **Crassatella producta,** *Conrad.* — Miss.
716. **Venericardia Jacksonensis,** *Conrad.* — Miss.
717. **Astarte parilis,** *Conrad.* — Miss.
718. **Gouldia pygmæa,** *Conrad.* — Miss.

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Erycinidæ.

719. **Alveinus parvus,** *Conrad.* Miss.

Ungulinidæ.

720. **Sphærella bulla,** *Conrad.* Miss.
721. **Sphærella turgida,** *Conrad.* Miss.
722. **Mysia eburnea,** *Conrad.* Miss.

Lucinidæ.

723. **Lucina curta,** *Conrad.* Miss.
724. **Lucina mississippiensis,** *Conrad.* Miss.
725. **Lucina perlevis,** *Conrad.* Miss.

Cardiidæ.

726. **Protocardia lima,** *Conrad.* Miss.
727. **Protocardia Nicoleti,** *Conrad.* Miss.; La.

Veneridæ.

728. **Dione annexa,** *Conrad.* Miss.
729. **Dione securiformis,** *Conrad.* Miss.
730. **Dione vicksburgensis,** *Conrad.* Miss.

Tellinidæ.

731. **Tellina albaria,** *Conrad.* Miss.
732. **Tellina eburneopsis,** *Conrad.* Miss.
733. **Tellina linifera,** *Conrad.* Miss.

Corbulidæ.

734. **Corbula bicarinata,** *Conrad.* Miss.
735. **Corbula densata,** *Conrad.* Miss.
736. **Corbula filosa,** *Conrad.* Miss.

Pholadidæ.

737. **Teredo mississippiensis,** *Conrad.* Miss.

Class GASTEROPODA.

Pleurobranchidæ.

738. **Operculatum planulatum,** *Conrad.* Miss.

Capulidæ.

739. **Capulus americanus,** *Conrad.* Miss.

Calyptræidæ.

740. **Trochita alta,** *Conrad.* Miss.

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Onustidæ.

741. **Onustus humilis**, *Conrad.* Miss.

Turritellidæ.

742. **Mesalia alveata**, *Conrad.* Miss.

Cypræidæ.

743. **Cypræa sphæroides**, *Conrad.* Miss.
744. **Cypræa (Sulcocypræa) lintea**, *Conrad.* Miss.
745. **Cyprædia fenestralis**, *Conrad.* Miss.

Strombidæ.

746. **Platyoptera extenta**, *Conrad.* Miss.
747. **Calyptrophorus eburneus**, *Conrad.* Miss.
748. **Calyptrophorus stamineus**, *Conrad.* Miss.

Conidæ.

749. **Conus tortilis**, *Conrad.* Miss.

Architectonicidæ.

750. **Architectonica acuta**, *Conrad.* Miss.
751. **Architectonica bellistriata**, *Conrad.* Miss.

Naticidæ.

752. **Natica permunda**, *Conrad.* Miss.

Scalaridæ.

753. **Cirsostrema bella**, *Conrad.* Miss.

Cassididæ.

754. **Galeodea (Galeodaria) Petersoni**, *Conrad.* Miss.
755. **Galeodea (Galeodaria) quinquecostata**, *Conrad.* Miss

Mitridæ.

756. **Lapparia dumosa**, *Conrad.* Miss
757. **Fusimitra conquisita**, *Conrad.* Miss.

Volutidæ.

758. **Volutilithes symmetricus**, *Conrad.* Miss.
759. **Caricella polita**, *Conrad.* Miss.
760. **Caricella subangulata**, *Conrad.* Miss.

Purpuridæ.

761. **Pseudoliva (Buccinorbis) perspectiva**, *Conrad.* Miss.

Muricidæ.

762. **Clavella humerosa**, *Conrad.* Miss.

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763. **Clavella mississippiensis,** *Conrad.* Vicks.
764. **Clavifusus dumosus,** *Conrad.* Miss.

Class **CEPHALOPODA.**

Order **TETRABRANCHIATA.**

Nautilidæ.

765. **Aturia alabamensis,** (*Morton*) *Conr.* N. J.; S. C.; Ala.; Miss.

Subkingdom **ARTICULATA.**

Class **CRUSTACEA.**

Order **CIRRIPEDIA.**

Balanidæ.

766. **Balanus peregrinus,** *Morton.* S. Car.

B. OLIGOCENE.

Subkingdom **RADIATA.**

Class **POLYPI.**

Order **ACTINARIA.**

Turbinolidæ.

767. **Turbinolia caulifera,** *Conrad.* Vicks.

Madreporidæ.

768. **Dendrophyllæa mississippiensis,** *Conrad.* Vicks.

Subkingdom **PROTOZOA.**

Class **RHIZOPODA.**

Order **FORAMINIFERA.**

Cyclostigidæ.

769. **Orbitolites (Orbitoides) supera,** *Conrad.* Vicks.

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Subkingdom MOLLUSCA.

Class LAMELLIBRANCHIATA.

Ostreidæ.

770. **Ostrea vicksburgensis,** *Conrad.* Vicks.

Pectinidæ.

771. **Radula staminea,** *Conrad.* Vicks.

Nuculidæ.

772. **Nucula serica,** *Conrad.* Vicks.
773. **Nucula vicksburgensis,** *Conrad.* Vicks.
774. **Nuculana mucronata,** *Conrad.* Vicks.
775. **Nuculana parilis,** *Conrad.* Vicks.

Arcidæ.

776. **Arca mississippiensis,** *Conrad.* Vicks.
777. **Arca protracta,** *Conrad.* Vicks.
778. **Cucullarca mississippiensis,** *Conrad.* Vicks.
779. **Axinæa arotata,** *Conrad.* Vicks.
780. **Axinæa mississippiensis,** *Conrad.* Vicks.

Aviculidæ.

781. **Avicula argentea,** *Conrad.* Vicks.

Mytilidæ.

782. **Perna mississippiensis,** *Conrad.* Vicks

Crassatellidæ.

783. **Crassatella mississippiensis,** *Conrad.* Vicks.

Ungulinidæ.

784. **Scintilla oblonga,** *Conrad.* Vicks.

Lucinidæ.

785. **Lucina perlevis,** *Conrad.* Vicks.
786. **Mysia eburnea,** *Conrad.* Vicks.
787. **Sphærella turgida,** *Conrad.* Vicks.

Chamidæ.

788. **Chama mississippiensis,** *Conrad.* Vicks.

Cardiidæ.

789. **Cardium (Trachycardium) globosum,** *Conrad.* Vicks.
790. **Cardium (Cerastoderma) eversum,** *Conrad.* Vicks.
791. **Cardium (Cerastoderma) vicksburgense,** *Conrad.* Vicks.
792. **Protocardia diversa,** *Conra l.* Vicks.

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Veneridæ.

793. **Chione mississippiensis**, *Conrad.* Vicks.
794. **Dione astartiformis**, *Conrad.* Vicks.
795. **Dione imitabilis**, *Conrad.* Vicks.
796. **Dione sobrina**, *Conrad.* Vicks.
797. **Dione subimpressa**, *Conrad.* Vicks.

Tellinidæ.

798. **Gari lintea**, *Conrad.* Vicks.
799. **Gari papyria**, *Conrad.* Vicks.
800. **Gari mississippiensis**, *Conrad.* Vicks.
801. **Donax funerata**, *Conrad.* Vicks.
802. **Tellina vicksburgensis**, *Conrad.* Vicks.
803. **Abra mississippiensis**, *Conrad.* Vicks.
804. **Abra perovata**, *Conrad.* Vicks.
805. **Abra staminea**, *Conrad.* Vicks.

Mactridæ.

806. **Mactra mississippiensis**, *Conrad.* Vicks.

Corbulidæ.

807. **Corbula alta**, *Conrad.* Vicks.
808. **Corbula engonata**, *Conrad.* Vicks.
809. **Corbula interstriata**, *Conrad.* Vicks.
810. **Corbula laqueata**, *Conrad.* Vicks.

Pholadidæ.

811. **Pholameria triquetra**, *Conrad.* Miss.

Class GASTEROPODA.

Cylichnidæ.

812. **Cylichna crassiplica**, *Conrad.* Vicks.

Actæonidæ.

813. **Ringinella mississippiensis**, *Conrad.* Vicks.
814. **Actæon Andersoni**, *Conrad.* Vicks.

Dentaliidæ.

815. **Dentalium mississippiense**, *Conrad.* Vicks.

Fissurellidæ.

816. **Fissurella mississippiensis**, *Conrad.* Vicks.

Calyptræidæ.

817. **Trochita tetrica**, *Conrad.* Vicks.

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Vanikoridæ.

818. **Vanikoro mississippiensis,** *Conrad.* Vicks.

Turritellidæ.

819. **Turritella mississippiensis,** *Conrad.* Vicks.

Cancellariidæ.

820. **Cancellaria funerata,** *Conrad.* Vicks.
821. **Cancellaria mississippiensis,** *Conrad.* Vicks.

Cypræidæ.

822. **Cypræa sphæroides,** *Conrad.* Vicks.
823. **Cypræa (Sulcocypræa) lintea,** *Conrad.* Vicks.

Strombidæ.

824. **Aphorrhais (Alipes) liratus,** *Conrad.* Vicks.

Conidæ.

825. **Conus alveatus,** *Conrad.* Vicks.

Architectonicidæ.

826. **Architectonica trilirata,** *Conrad.* Vicks.

Terebridæ.

827. **Terebra divisura,** *Conrad.* Vicks.
828. **Terebra tantula,** *Conrad.* Vicks.

Scalariidæ.

829. **Scalina triquintinaria,** *Conrad.* Vicks.

Naticidæ.

830. **Catinus mississippiensis,** *Conrad.* Vicks.

Ficidæ.

831. **Ficopsis mississipiensis,** *Conrad.* Vicks.

Cassididæ.

832. **Semicassis cælatura,** *Conrad.* Vicks.
833. **Semicassis mississipiensis,** *Conrad.* Vicks.
834. **Galeodia lintea,** *Conrad.* Vicks.
835. **Galeodia tricarinata,** *Conrad.* Vicks.
836. **Morum harpula,** *Conrad.* Vicks.

Mitridæ.

837. **Fusimitra cellulifera,** *Conrad.* Vicks.
838. **Fusimitra conquisita,** *Conrad.* Vicks.
839. **Fusimitra mississippiensis,** *Conrad.* Vicks.

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840. **Fusimitra staminea**, *Conrad.* Vicks.
841. **Conomitra vicksburgensis**, *Conrad.* Vicks.

Volutidæ.

842. **Otocheilus mississippiensis**, *Conrad.* Vicks.
843. **Caricella demissa**, *Conrad.* Vicks.

Turbinellidæ.

844. **Mazza Wilsoni**, *Conrad.* Vicks.
845. **Cordieria perexilis**, *Conrad.* Vicks.
846. **Cordieria protracta**, *Conrad.* Vicks.

Dactylidæ.

847. **Lamprodroma mississippiensis**, *Conrad.* Vicks.
848. **Monoptygma Leai**, *Whitfield.* Vicks.

Purpuridæ.

849. **Cornulina crassicornuta**, *Conrad.* Vicks.

Buccinidæ.

850. **Tritiaria mississippiensis**, *Conrad.* Vicks.

Tritonidæ.

851. **Distorsio crassidens**, *Conrad.* Vicks.
852. **Bursa abbreviata**, *Conrad.* Vicks.
853. **Bursa mississippiensis**, *Conrad.* Vicks.

Pleurotomidæ

854. **Surcula cochlearis**, *Conrad.* Vicks.
855. **Surcula congesta**, *Conrad.* Vicks.
856. **Surcula decliva**, *Conrad.* Vicks.
857. **Surcula rotædens**, *Conrad.* Vicks.
858. **Surcula servata**, *Conrad.* Vicks.
859. **Surcula tenella**, *Conrad.* Vicks.
860. **Scobinella cælata**, *Conrad.* Vicks.
861. **Cochlespira cristata**, *Conrad.* Vicks.
862. **Drillia abundans**, *Conrad.* Vicks.
863. **Drillia eboroides**, *Conrad.* Vicks.
864. **Drillia mississippiensis**, *Conrad.* Vicks.
865. **Drillia ? tantula**, *Conrad.* Vicks.
866. **Conorbis porcellanus**, *Conrad.* Vicks.

Muricidæ.

867. **Typhis curvirostratus**, *Conrad.* Vicks.
868. **Murex mississippiensis**, *Conrad.* Vicks.
869. **Fusus mississippiensis**, *Conrad.* Vicks.
870. **Sipho vicksburgensis**, *Conrad.* Vicks.
871. **Busycon spiniger**, *Conrad.* Vicks.

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APPENDIX.

In Professor Emmons's Report on the Geology of North Carolina are descriptions of a few Eocene fossils, some of which I am unable to arrange stratigraphically:—

ECHINODERMATA.

Cidaridæ.

1. **Cidaris Mitchelli**, *Emmons.* — N. Car.: Jackson Group.
2. **Cidaris carolinensis**, *Emmons.* — N. Car.: Jackson Group.

Clypeasteridæ.

3. **Echinocyamus parvus**, *Emmons.* — N. Car.
4. **Scutella Lyelli**, *Emmons.* — N. Car.
5. **Gonioclypeus subangulatus**, *Emmons.* — N. Car.

Crinoidea.?[1]

6. **Microcrinus conoideus**, *Emmons.* — N. Car.

POLYZOA.

Escharidæ.

7. **Lunulites contiguus**, *Emmons.* — N. Car.

[1] I believe this to be the masticatory apparatus of Mortonia altus. It is certainly no Crinoid.

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ADDENDA.

Turbinellidæ.

Mazzalina pyrula, *Conrad.* (Eocene.) Ala.

Scutellidæ.

Mortonia quinquefaria, (*Say*) *Conrad.* (Eocene.) Ga.
Scutella Rogersi, Agass. not Morton.
Mortonia Rogersi, Desor.

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NOTES AND EXPLANATIONS.

2 = **Nummulites floridana**, CONRAD, Am. Jour. Sci. II, 2d series, 399, 3.
3 = **Turbinolia Goldfussii**, LEA, ib. 195.
4 = **Turbinolia Stokesii**, LEA, Cont. to Geol. 194.
8 = **Anthophyllum cuneiforme**, CONRAD.
10 = **Turbinolia Maclurii**, LEA, Cont. to Geol. 193, 6, 206.
12 = **Scutella Lyelli**, CONRAD, Jour. Acad. Nat. Sci. VII, 152.
13 = **Orbitolites interstitia** (LEA), *Lunulites*, GABB & HORN.
15 = **Lunulites Bouei**, LEA, Cont. to Geol. 189, 6, 202.
16 = **Orbitolites discoidea**, LEA, ib. 192, 6, 205.
17 = **Lunulites Ducloseii**, LEA, ib. 190, 6, 203.
19 = **Terebratula wilmingtonensis**, LYELL & SOWERBY, Jour. Geol. Soc. I, 431.
29 = **Ostrea eversa**, DESHAYES, Cog. Foss. Supplement, pl. XXXIV, f. 5, 6, 7, 8. *O. subeversa*, Conrad, Eocene Cat. Am. Jour. Conch. I, 15. It belongs to the section of *Espèces gryphoïdes* of Deshayes.
35 = **Pecten calvatus**, MORTON, Synopsis, 58, 10, 3, 1834.
41 = **Leda compsa**, GABB, Jour. Acad. Nat. Sci. IV, 2d series, 387, 57.
42 = **Nucula cultelliformis**, ROGERS, Trans. Amer. Philos. Soc., V, new ser. 339.
46 = **Nucula magna**, LEA, Cont. to Geol. 196, 6, 121.
47 = **Nucula media**, LEA, ib. 83, 3, 62.
49 = **Leda oregona**, SHUMARD, Trans. Acad. Nat. Sci. of St. Louis, I, 121.
50 = **Nucula ovula**, LEA, ib. 80, 3, 59.
52 = **Nucula parva**, ROGERS, Trans. Am. Phil. Soc. V, new ser. 340.
53 = **Nucula plana**, LEA, Cont. to Geol. 199, 6, 213.
54 = **Nucula plicata**, LEA, ib. 85, 3, 64.
56 = **Nucula pulcherrima**, LEA, ib. 84, 3, 63.
57 = **Nucula semen**, LEA, ib. 200, 6, 214.
59 = **Leda willametensis**, SHUMARD, Trans. Acad. Nat. Sci. of St. Louis, I, 121.
74 = **Cucullæa ononchella**, ROGERS, Trans. Am. Phil. Soc. VI, 2d ser. 372, 28, 2.
75 = **Cucullæa transversa**, ROGERS, ib. 373, 29, 1.
78 = **Arca rhomboidella**, LEA, Cont. to Geol. 74, 2, 52.
83 = **Pectunculus ellipsis**, LEA, ib. 78, 3, 56.
86 = **Nucula pectunculoides**, LEA, ib. 81, 3, 60.
96 = **Crenella concentrica**, GABB, Palæont. of Cal. 186, 24, 169.

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114 = **Astarte minutissima**, Lea, Cont. to Geol. 64, 2, 39.

115 = **Astarte parva**, Lea, Cont. to Geol. 63, 2, 37. *M. minor* (*Astarte minor*, Lea) is probably a distinct species, but closely allied, fig. 38.

130 = **Egeria inflata**, Lea, ib. 50, 1, 18.

139 = **Dosinia gyrata**, Gabb, Palæont. of Cal. 168, 23, 148.

146 = **Corbis lamellosa**, Conrad (not Lam.), Foss. Shells of Tert. Form.

164 = **Cytherea lenticularis**, Rogers, Trans. Am. Phil. Soc. VI, 2d ser. 372, 28, 1.

165 = **Venus floridana**, Conrad, Am. Jour. Sci. II, 2d ser. 399.

166 = **Venus penita**, Conrad, ib. 400.

183 = **Cytherea ovata**, Rogers, Trans. Am. Phil. Soc.

213 = **Egeria plana**, Lea, Cont. to Geol. 54, 1, 24.

227 = **Anatina claibornensis**, ib. 40, 1, 8.

240 = **Solen diegoensis**, Gabb, Palæont. of Cal. 213, 32, 280.

241 = **Solen parallelus**, Gabb, ib. 146, 22, 117.

246 = **Bulla Dekayi**, Lea, Cont. to Geol. 200, 6, 215.

259 = **Actæon impressa**, Gabb, Palæont. of Cal. 142, 21, 106.

262 = **Pasithea striata**, Lea, Cont. to Geol. 102, 4, 83.

264 = **Pasithea sulcata**, Lea, ib. 103, 4, 84.

265 = **Marginella biplicata**, Lea, ib. 201, 6, 216.

266 = **Melania nitidula**, Meek, Proc. Acad. Nat. Sci. July, 1860.

268 — Subgenus *Pleurolimnæa*, Meek (under *Limnæa*), like *Acella*, but differs in having slender distant longitudinal costæ, and its aperture narrowed, instead of rounded, anteriorly. Type *Limnæa tenuicostata*, Meek & Hayden.

280 = **Bulimus limnæiformis**, Meek & Hayden, not *Spiraxis limnæiformis*, Shuttleworth.

285 = **Helix spatiosa**, Meek, Proc. Acad. Nat. Sci. 1861, 446.

288 = **Bulimus perversus**, Meek & Hayden, not *Clausilia perversa*, Pfeiffer.

289 = **Bulimus teres**, Meek & Hayden, Proc. Acad. Nat. Sci. June, 1836, 117.

290 = **Bulimus vermiculus**, Meek & Hayden, ib. June, 1836, 118.

296 = **Dentalium (Ditrupa ?) pusillum**, Gabb, Palæont. of Cal. 139, 21, 99.

297 = **Ditrupa subcoarctata**, Gabb, Jour. Acad. Nat. Sci. IV, 2d ser. 386, 67, 47.

303 = **Rotella nana**, Lea, Cont. to Geol. 214, 6, 225.

306 = **Narica diegoana**, Conrad, Pacific R. R. Rep. V, 326, 5, 39.

307 = **Hipponyx pygmæa**, Lea, Cont. to Geol. 95, 3, 75.

308 = **Calyptræa trochiformis**, Lea, ib. 96, 3, 76.

314 = **Galerus excentricus**, Gabb, Palæont. of Cal. 136, 20, 95, and 29, 232.

329 = **Turritella striata**, Lea, Cont. to Geol. 131, 4, 122.

340 = **Melania ? multistriata**, Meek & Hayden, Proc. Acad. Nat. Sci. June, 1856.

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341 = **Paludina multilineata**, Meek & Hayden, ib. June, 156.
342 = **Paludina vetula**, Meek & Hayden, Proc. Acad. Nat. Sci. June, 1856.
343 = **Melania Anthonii**, Meek & Hayden, ib. March, 1856.
344 — Genus *Micropyrgus*, Meek. Founded upon a minute, smooth, subcylindrical shell, with a rather obtuse apex, and a subrhombic aperture. It is much like *Pyrgula*, but differs in not having its axis perforate, while its whorls are without carinæ, though they are prominent and obtusely subangular below the middle. Occurs with fresh-water forms. Type *Melania minutula*, Meek & Hayden, Proc. Acad. Nat. Sci. June, 1856.
345 = **Natica alabamiensis**, Whitfield, Am. Jour. Conch. I, 265, 27, 9–10.
346 = **Natica erecta**, Whitfield, ib. I, 264, 27, 11.
347 = **Melania humerosa**, Meek & Hayden, Proc. Acad. Nat. Sci. July, 1860.
351 = **Cerithium nodulosum**, Hall, Fremont's Report.
352 = **Melania arcta**, Meek & Hayden, Proc. Acad. Nat. Sci. July, 1860.
353 = **Cerithium Fremontii**, Hall, Fremont's Report.
354 = **Melania Simpsoni**, Meek, Proc. Acad. Nat. Sci. July, 1860.
355 = **Melania sublævis**, Meek & Hayden, ib. March, 1857.
356 = **Melania subtortuosa**, Meek & Hayden, ib. May, 1857.
357 = **Melania tenuicarinata**, Meek & Hayden, ib. May, 1857.
358 = **Cerithium tenerum**, Hall, Fremont's Report.
397 = **Solarium Henrici**, Lea, Cont. to Geol. 119, 4, 107.
400 = **Solarium ornatum**, Lea, ib. 120, 4, 108.
401 = **Delphinula plana**, Lea, ib. 117, 4, 104.
402 = **Solarium pseudogranulatum**, D'Orbigny, Prodromus, 2, 349. *S. granulata*, Lea, Cont. to Geol. 122, 4, 111.
407 = **Delphinula depressa**, Lea, Cont. to Geol. 118, 4, 105.
409 = **Turbo lineatus**, Lea, ib. 126, 4, 116.
410 = **Planaria nitens**, Lea, ib. 124, 4, 113.
419 = **Pasithea aciculata**, Lea, ib. 102, 4, 82.
423 = **Pasithea lugubris**, Lea, ib. 101, 4, 81.
424 = **Pasithea notata**, Lea, ib. 101, 4, 80.
427 = **Pasithea secale**, Lea, ib. 100, 4, 19.
431 = **Actæon melanellus**, Lea, ib. 113, 4, 99.
433 = **Actæon pygmæus**, Lea, ib. 114, 4, 101.
434 = **Actæon striatus**, Lea, ib. 114, 4, 100.
437 = **Mitra costata**, Lea, ib. 166, 5, 172.
453 = **Natica minima**, Lea, Cont. to Geol., 107, 4, 91.
459 = **Natica alveata**, Con. Pacif. Rail R. Reports, 5, 321, 2, 8. *Amauropsis alveata*? Gabb. Palmont, of Cal. fig. 59?
462 = **Natica gibbosa**, Lea, ib. 108, 4, 92.
470 = **Naticina obliqua**, Gabb, Palæont. of Cal. 109, 21, 112.
481 = **Sycotypus penitus**, Conrad, Foss. Shells of Tert. Form. 32.
476 = **Buccinum Sowerbii**, Lea, Cont. to Geol. 164, 5, 169.

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482 = **Fusus Remondii**, GABB, Palæont. of Cal., 87, 18, 36.
478 = **Fusus Cooperi**, GABB, ib. 1, 86, 28, 207.
480 = **Ficus mammillatus**, GABB, ib. I, 276, 32, 276.
483 = **Hemifusus Hornii**, GABB, Palæont. of Cal. 86, 28, 206.
504 = **Mitra Flemingii**, LEA, 170, 6, 177.
508 = **Mitra fusoides**, LEA, Cont. to Geol. 169, 6, 176.
510 = **Mitra Mooreana**, GABB, Jour. Acad. Nat. Sci. IV, 2d ser. 383, 67, 24.
513 = **Mitra lineata**, LEA, Cont. to Geol. 168, 5, 174.
514 = **Mitra minima**, LEA, ib. 168, 6, 175.
521 = **Fasciolaria Moorei**, GABB, Jour. Acad. Nat. Sci. IV, 2d ser. 382, 67, 27.
522 = **Fasciolaria plicata**, LEA, Cont. to Geol. 143, 5, 142.
525 = **Ancillaria elongata**, GABB, Palæont. of Cal. 100, 54, 18.
526 = **Oliva gracilis**, LEA, Cont. to Geol. 182, 6, 196.
527 = **Oliva Phillipsii**, LEA, ib. 184, 5, 199.
528 = **Anolax gigantea**, LEA, Cont. to Geol. 180, 6, 193.
533 = **Anolax plicata**, LEA, ib. 181, 6, 199.
534 = **Agaronia punctulifera**, GABB, Jour. Acad. Nat. Sci. 2d ser. IV, 381, 67, 22.
541 = **Fusus Taitii**, LEA, Cont. to Geol. 152, 5, 159. *Monoceros armigera*, Conrad.
546 = **Monoceros sulcatum**, LEA, ib. 163, 5, 168.
551 = **Tritonium diegoensis**, GABB, Palæont. of Cal. I, 95, 18, 44.
566 = **Pleurotoma Beaumontii**, LEA, Cont. to Geol. 134, 4, 127.
569 = **Pleurotoma cælata**, LEA, ib. 132, 4, 123.
570 = **Pleurotoma Childreni**, LEA, ib. 137, 4, 132.
572 = **Pleurotoma Desnoyersii**, LEA, ib. 135, 4, 128.
575 = **Pleurotoma Kellogii**, GABB, Jour. Acad. Nat. Sci. IV, 2d ser. 379, 67, 10.
578 = **Pleurotoma monilifera**, LEA, Cont. to Geol. 133, 4, 126.
579 = **Pleurotoma nodocarinata**, GABB, Jour. Acad. Nat. Sci. IV, 2d ser. 379, 67, 13.
581 = **Pleurotoma obliquua**, LEA, Cont. to Geol. 136, 4, 131.
582 = **Pleurotoma rugosa**, LEA, ib. 136, 4, 130.
584 = **Pleurotoma Sayi**, LEA, ib. 133, 4, 125.
588 = **Pleurotoma varicostata**, GABB, Palæont. of Cal. I, 93, 18, 47.
590 = **Pleurotoma Lonsdalii**, LEA, Cont. to Geol. 132, 4, 124.
591 = **Pleurotoma texana**, GABB, Jour. Acad. Nat. Sci. IV. 2d ser. 379, 67, 11.
611 = **Papillina altilis**, CONRAD, Eocene Cat. Am. Jour. Conch. I, 17.
612 = **Fusus Cooperi**, CONRAD, Foss. Shells of Tert., 55, 18, 15.
613 = **Fusus Conybearii**, LEA, Cont. to Geol. 149, 5, 154.
639 = **Pelagus vanuxemi**, CONRAD. I am not certain that the New Jersey species is identical with *A. zicsac*, but in a specimen of

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a specimen of the California *Aturia*, I worked out a very clear outline of the septa and found the lobes to be wider than those of any of the figures of the European *A. ziczac*, and I am therefore disposed to retain the name of *A. angustata*, which should have been inserted in the Check List.

640 = **Nautilus Lamarckii**, DESHAYES, Coq. Foss. des env. de Paris II, 767, c, i. *N. Burtini*, Galeotti.

648 = **Clavella vicksburgensis**, CONRAD.

651 = **Nummulites Mantelli**, MORTON, Synopsis, 45, 5, 9.

658 = **Scutella crustuloides**, MORTON, ib. 77, 15, 10.

660 = **Scutella pileus-sinensis**, RAVENEL, Proc. Acad. Nat. Sci.

663 = **Echinus infulatus**, MORTON, ib. 75, 10, 7.

664 = **Scutella Jonesii**, FORBES, Quart. Jour. Geol. I, 440.

665 = **Scutella Rogersi**, MORTON, Synopsis, 77, 13, 3.

666 = **Mortonia tumida**, CONRAD, Proceed. Acad. Nat. Sci. 1865, 184.

667 = **Pyrgorhynchus Mortonis**, MICH. Rev. et Mag. Zool. 1850, 2.

670 = **Catopygus patelliformis**, BOUVÉ, Proc. Bost. Soc. Nat. Hist. IV, 2.

674 = **Cellepora tubulata**, LONSDALE, Quart. Jour. Geol. Soc. I, 70.

690 = **Terebratula lachryma**, MORTON, Synopsis, 72, 10, 11, and 16, 6.

696 = **Plagiostoma dumosa**, MORTON, ib. 59, 16, 8.

738 = **Umbrella planulata**, CONRAD, Wailes' Geol. of Miss. pl. 14, f. 1.

755 — Described from an imperfect specimen as n. g. *Doliopsis*. It is, however, generically and specifically allied to *Galeodea Petersoni*, and therefore the genus is abandoned.

NOTE.—Synonymes and references to my own species will be found in the American Journal of Conchology, by George W. Tryon, Vol. I, p. 1.

The shells of California which I have inserted in this Check List are regarded as Cretaceous species by Mr. Gabb. They are only referred to the Eocene provisionally in consequence of their association with the genera *Aturia* and *Venericardia*, neither of which as properly restricted existed in the Cretaceous period, and from the fact that Mr. Gabb does not name one exclusively Cretaceous genus in Division B, except *Anchura* (*Aporrhais*), which, as it was found "in a single stratum of greenish-gray limestone," may not belong to Division B.

It will be observed that as I have published a Check List of the older Tertiary formation and its subdivisions and Mr. Meek a Check List of the Miocene, these together constitute all the Tertiary Divisions of North America; and so far as our knowledge extends all the species are extinct. The Oligocene has been found in St. Domingo, and is supposed to occur in Australia, where Professor McCoy thinks he finds four of the species of this formation,[1] identical with recent shells—*Limopsis Belcheri*, *L. aurita*, *Pectunculus laticostatus*, and *Corbula sulcata*. Not one of these species has

[1] Older Miocene, McCoy.

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been found in North America. No trace has been discovered of any Tertiary newer than the Miocene.

All the Oligocene species were found by myself at Vicksburg, Mississippi, a few of which are said by Prof. Hilgard to occur in the Jackson Eocene. I found one only at Vicksburg, a solitary specimen of *Fusimitra conquisita*, which is also a Jackson species; and, I think, that any mixture of Oligocene and Eocene forms was accidental after the latter fauna became extinct.

The Jackson group was so named by Prof. Eugene W. Hilgard in his learned and able report on the Geology of Mississippi.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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OF THE

INVERTEBRATE FOSSILS

OF

NORTH AMERICA.

MIOCENE.

BY

F. B. MEEK.

WASHINGTON:
SMITHSONIAN INSTITUTION.
NOVEMBER, 1864.

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Secretary S. I.

SMITHSONIAN INSTITUTION,
WASHINGTON, April, 1864.

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CHECK LIST

OF THE

INVERTEBRATE FOSSILS OF NORTH AMERICA.

CRETACEOUS FORMATION.

BY

F. B. MEEK.

SUBKINGDOM **PROTOZOA.**

CLASS **AMORPHOZOA.**

1. **Eudea? dichotoma,** *Gabb.* N. J.

CLASS **RHIZOPODA.**

Order **FORAMINIFERA.**

Lagenidæ.

2. **Phonemus (Cristellaria) rotulatus** *D'Orb.?* N. J.
3. **Phonemus (Flabellina) cuneatus,** (*Morton*) *Meek.* N. J.
4. **Phonemus (Flabellina) sagittarius,** (*Lea*) *Meek.* N. J.
5. **Phonemus (Dentalina) pulcher,** *Gabb.* N. J.

Globigerinidæ.

6. **Rotalia lenticulina,** Dak.; Neb.
7. **Rotalia senaria,** Dak.; Neb.
8. **Tinoporus (Orbitolina) texanus** (*Roemer*) *Meek.* Tex.
9. **Textularia americana,** *Ehrenberg.*
10. **Textularia missouriensis,** *Ehrenberg.* Dak.; Neb.
11. **Textularia globulosa,** *Ehrenberg.* Dak.; Neb.
12. **Textularia phyllodes,** (*Ehrenberg*) *Meek.* Dak.; Neb.

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Subkingdom RADIATA.

Class POLYPI.

Order ACTINARIA.

Fungidæ.

13. **Micrabacia americana**, *Meek & Hayden.* — Neb.

Asteridæ.

14. **Trochosmilia conoidea**, *Gabb & Horn.* — N. J.
15. **Trochosmilia? texana**, *Conr.* — Tex.
16. **Montlivaltia atlantica**, (*Morton*) *Lonsdale.* — N. J.
17. **Astrocœnia guadaloupae**, *Roemer.* — Tex.

Turbinolidæ.

18. **Platytrochus speciosus**, *Gabb & Horn.* — Ten.
19. **Turbinolia [?] inauris**, *Morton.* — N. J.; Ala.
20. **Flabellum striatum**, *Gabb & Horn.* — Ala.

Order ALCYONARIA.

Gorgonidæ.

21. **? Websteria cretacea**, *Meek & Hayden.* — Dak.

Class ECHINODERMATA.

Order ECHINOIDEA.

Cidaridæ.

22. **Cidaris Galeottii**, *Desor.* — Mex.
23. **Cidaris hemigranosus**, *Shumard.* — Tex.
24. **Cidaris [?] pustulosus**, *Galeotti.* — Mex.
25. **Pseudodiadema diatretum**, (*Morton*) *Desor.* — N. J.
26. **Pseudodiadema texanum**, (*Roemer*) *Desor.* — Tex.

Galeriidæ.

27. **Pyrina Parryi**, *Hall.* — Tex.
28. **Holectipus planatus**, *Roemer.* — Tex.
29. **Holectipus simplex**, *Shumard.* — Tex.

Cassidulidæ.

30. **Nucleolites crucifer**, *Morton.* — N. J.
31. **Cassidulus æquoreus**, *Morton.* — Ala.
32. **Cassidulus florealis**, (*Morton*) *Gabb.* — Del.
33. **Pygurus geometricus**, (*Morton*) *Desor.* — Del.

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Spatangidæ.

34. **Holaster simplex,** *Shumard.*	Ind. T.
35. **Holaster comanchesi,** *Marcou.*	Tex.
36. **Toxaster elegans,** *Shumard.*	Ind. T.
37. **Toxaster texanus,** *Roemer.*	Tex.
38. **Hemiaster? Humphreysanus,** *Meek & Hayden.*	Id.
39. **Hemiaster? stella,** (*Morton*) *Desor.*	Ala.
40. **Hemiaster [?] parastatus,** (*Morton*) *Desor.*	Ala.
41. **Hemiaster texanus,** *Roemer.*	Tex.

Subkingdom MOLLUSCA.

Class POLYZOA.

Escharidæ.

42. **Eschara digitata,** *Morton.*	N. J.
43. **Cellepora prolifera,** *Gabb & Horn.*	N. J.
44. **Cellepora exserta,** *Gabb & Horn.*	N. J.
45. **Cellepora Janewayi,** *Gabb & Horn.*	Miss.
46. **Cellepora pumila,** *Gabb & Horn.*	N. J.
47. **Reptocelleporia aspera,** *Gabb & Horn.*	N. J.
48. **Escharifora typica,** *Gabb & Horn.*	N. J.

Escharinellidæ.

49. **Escharinella muralis,** *Gabb & Horn.*	N. J.

Porinidæ.

50. **Reptoporina carinata,** *Gabb & Horn.*	N. J.

Escharellinidæ.

51. **Escharellina prolifera,** *Gabb & Horn.*	N. J.
52. **Escharipora distans,** *Gabb & Horn.*	N. J.
53. **Escharipora Abbottii,** *Gabb & Horn.*	N. J.
54. **Escharipora immersa,** *Gabb & Horn.*	N. J.
55. **Pliophlœa sagena,** (*Morton*) *Gabb & Horn.*	N. J.
56. **Raptascharipora marginata,** *Gabb & Horn.*	N. J.

Flustrellaridæ.

57. **Biflustra torta,** *Gabb & Horn.*	N. J.
58. **Biflustra disjuncta,** *Gabb & Horn.*	N. J.
59. **Pyripora irregularis,** *Gabb & Horn.*	N. J.
60. **Membranipora abortiva,** *Gabb & Horn.*	N. J.
61. **Membranipora perampla,** *Gabb & Horn.*	N. J.
62. **Membranipora plebia,** *Gabb & Horn.*	N. J.

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Flustrellidæ.

63. **Flustrella capistrata,** *Gabb & Horn.* N. J.
64. **Flustrella cylindrica,** *Gabb & Horn.* N. J.
65. **Reptoflustrella [?] heteropora,** *Gabb & Horn.* N. J.
66. **Reptoflustrella tubulata,** *Gabb & Horn.* ?

Eleidæ.

67. **Retelea ovalis,** *Gabb & Horn.* N. J.

Fascigeridæ.

68. **Filifascigera megaera,** (*Lonsdale*) *D'Orb.* N. J.

Fascioporidæ.

69. **Fasciopora americana,** *Gabb & Horn.* N. J.

Tubigeridæ.

70. **Spiropora calamus,** *Gabb & Horn.* N. J.
71. **Idmonea contortilis,** *Lonsdale.* N. J.

Sparasidæ.

72. **Entalophora quadrangularis,** *Gabb & Horn.* N. J.
73. **Entalophora Conradii,** *Gabb & Horn.* N. J.
74. **Diastopora lineata,** *Gabb & Horn.* N. J.
75. **Alecto regularis,** *Gabb & Horn.* N. J.

Crisinidæ.

76. **Reticulipora sagena,** *Gabb & Horn.* N. J.
77. **Reticulipora dichotoma,** *Gabb & Horn.* N. J.
78. **Bicrisina Abbottii,** *Gabb & Horn.* N. J.

Cavidæ.

79. **Reptomulticava cepularis,** *Gabb & Horn.* N. J.

Crescisidæ.

80. **Crescis labiata,** *Gabb & Horn.* N. J.
81. **Multicresis parvicella,** *Gabb & Horn.* N. J.

Class BRACHIOPODA.

Lingulidæ.

82. **Lingula nitida,** *Meek & Hayden.* Id.
83. **Lingula subspatulata,** *Hall & Meek.* Dak.

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Terebratulidæ.

84.	**Terebratula guadaloupae,** *Roemer.*	Tex.
85*a*.	**Terebratula Harlani,** *Say.*	N. J.
86.	**Terebratula leonensis,** *Conr.*	Tex.
87.	**Terebratula wacoensis,** *Roemer.*	Tex.
88.	**Terebratulina floridana,** (*Morton*) *D'Orb.*	Ala.
89.	**Terebratulina Halliana,** *Gabb.*	N. J.
90.	**Terebratella plicata,** (*Say*) *D'Orb.*	N. J.
91.	**Terebratella Vanuxemi,** (*Lyell & Forbes*) *D'Orb.*	N. J.

? RUDISTA.

Radiolitidæ.

92.	**Caprotina Romerii,** *Gabb.*	Tex.
93.	**Caprotina [?] senseni,** (*Conr.*) *Gabb.*	Ark.
94.	**Caprotina [?] subtriquetra,** (*Roemer*) *Gabb.*	Tex.
95.	**Caprotina texana,** *Roemer.*	Tex.
96.	**Radiolites Aimesii,** *Tuomey.*	Ala.
97.	**Radiolites Austinensis,** *Roemer.*	Tex.; Ala.; Miss.
98.	**Radiolites lamellosus,** *Tuomey.*	Ala.
99.	**Radiolites Ormondii,** *Tuomey.*	Ala.
100.	**Radiolites Tuomeyanus,** *Gabb.*	Ala.

Caprinidæ.

101.	**Caprina crassifibra,** *Roemer.*	Tex.
102.	**Caprina guadaloupae,** *Roemer.*	Tex.
103.	**Caprina occidentalis,** *Conr.*	Tex.
104.	**Caprina planata,** *Conr.*	Tex.
105.	**Caprina quadrata,** *Conr.*	Tex.
106.	**Ichthyosarcolithus coraloides,** (*Hall & Meek*) *Gabb.*	Dak.
107.	**Ichthyosarcolithus cornutus,** *Tuomey.*	Ala.
108.	**Ichthyosarcolithus loricatus,** *Tuomey.*	Ala.
109.	**Ichthyosarcolithus quadrangularis,** *Tuomey.*	Ala.
110.	**Hippurites texanus,** *Roemer.*	Tex.

Class LAMELLIBRANCHIATA.

Ostreidæ.

111.	**Ostrea anomiæformis,** *Roemer.*	Tex.
112.	**Ostrea acuticostata,** *Galeotti.*	Mex.
113.	**Ostrea bella,** *Conr.*	Tex.
114.	**Ostrea belliplicata,** *Shumard.*	Tex.
115.	**Ostrea carinata,** *Lam.?*	Tex.
116.	**Ostrea confragosa,** *Conr.*	Miss.

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117. **Ostrea congesta,** *Conr.* Dak.; Neb.; Kans.; Ark.
118. **Ostrea crenulata,** *Tuomey.* Ala.
119. **Ostrea crenulimargo,** *Roemer.* Tex.
120. **Ostrea crenulimarginata,** *Gabb.* Ten.
121. **Ostrea denticulifera,** *Conr.* Ala.; Miss.; Ten.
122. **Ostrea Gabbana,** *Meek & Hayden.* Id.
123. **Ostrea glabra,** *Meek & Hayden.* Idah.; Utah.
124. **Ostrea larva,** *Lam.* N. J.; Del.; Ala.; Miss., &c.
125. **Ostrea lugubris,** *Conr.* Tex.
126. **Ostrea Lyoni,** *Shumard.* Tex.
127. **Ostrea multilirata,** *Conr.* Tex.
128. **Ostrea Owenana,** *Shumard.* Tex.
129. **Ostrea panda,** *Morton.* N. J.; Del.; Ala.
130. **Ostrea pandæformis,** *Gabb.* Miss.
131. **Ostrea patina,** *Meek & Hayden.* Id.
132. **Ostrea peculiaris,** *Conr.* Ala.
133. **Ostrea planovata,** *Shumard.* Tex.
134. **Ostrea plumosa,** *Morton.* N. J.; Ala.; Miss.; Ten.
135. **Ostrea quadriplicata,** *Shumard.* Tex.
136. **Ostrea robusta,** *Conr.* Tex.
137. **Ostrea subovata,** *Shumard.* Tex.; Ind. T.
138. **Ostrea subsimilis,** *D'Orb.* Mex.
139. **Ostrea subspatulata,** *Forbes.* N. J.; Ala.; Miss.; Tex.
140. **Ostrea tectiosta,** *Gabb.* N. J.; Ten.
141. **Ostrea translucida,** *Meek & Hayden.* Dak.
142. **Ostrea vellicata,** *Conr.* Tex.
143. **Gryphæa navia,** *Conr.* Tex.; N. Mex., &c.
144. **Gryphæa Pitcheri,** *Morton.* Ark.; Tex.; Ind. T.; N. Mex.; Ariz.
145. **Gryphæa thirsæ,** *Gabb.* Ala.
146. **Gryphæa vesicularis** (*Lk.*) *Sby.* N. J.; Del.; Ala.; Miss.; Tex.; Dak.?
147. **Exogyra arietina,** *Roemer.* Tex.
148. **Exogyra costata,** *Say.* N. J.; Del.; Ala.; Miss.; Tex., &c.
149. **Exogyra fimbriata,** *Conr.* Tex.
150. **Exogyra fragosa,** *Conr.* Tex.
151. **Exogyra interrupta,** *Conr.* Miss.
152. **Exogyra læviuscula,** *Roemer.* Tex.
153. **Exogyra lateralis,** (*Neilson*) *Gabb.* N. J.
154. **Exogyra Matheroniana,** (*D'Orb.?*) *Conr.* Tex.

Anomiidæ.

155. **Placunomia lineata,** *Conr.* Ten.
156. **Placunomia Saffordi,** *Conr.* Ten.
157. **Placunomia scabra,** (*Morton*) *Gabb.* N. J.
158. **Anomia argentaria,** *Morton.* N. J.; Ala.; Miss.; Ten.
159. **Anomia Flemingi,** *Meek.* Br. Am.
160. **Anomia obliqua,** *Meek & Hayden.* Dak.

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161. **Anomia sellæformis**, *Conr.* — Miss.
162. **Anomia subtrigonalis**, *Meek & Hayden.* — Dak.
163. **Anomia tellinoides**, *Morton.* — N. J.; Ala.; Miss.

Spondylidæ.

164. **Plicatula incongrua**, *Conr.* — Tex.
165. **Plicatula Saffordi**, *Conr.* — Ten.
166. **Plicatula tetrica**, *Conr.* — Ten.
167. **Plicatula urticosa**, *Morton.* — N. J.
168. **Spondylus echinatus**, (*Morton*) *Meek.* — N. J.
169. **Spondylus gregalis**, (*Morton*) *D'Orb.* — N. J.
170. **Spondylus guadaloupae**, *Roemer.* — Tex.

Limididæ.

171. **Lima acutilineata**, (*Conr.*) *Meek.* — N. J.; Ala.; Ten.
172. **Lima crenulicosta**, *Roemer.* — Tex.; Ala.; Miss.; Ten.
173. **Lima denticulata**, (*Gabb*) *Meek.* — Ala.
174 **Lima leonensis**, *Conr.* — Tex.
175. **Lima pelagica**, (*Morton*) *Meek.* — N. J.
176. **Lima reticulata**, *Lyell & Forbes.* — N. J.; Ten.; Ala.
177. **Lima squarrosa**, (*Gabb*) *Meek.* — Ala.
178. **Lima wacoensis**, *Roemer.* — Tex.

Pectenidæ.

179. **Neithea duplicosta**, (*Roemer*) *Gabb.* — Tex.
180. **Neithea Mortoni**, (*D'Orb.*) *Gabb.* — N. J.; Ten.; Ala.; Miss.
181. **Neithea occidentalis**, *Conr.* — Tex.
182. **Neithea quadricostata**, (*Sowb.*) *Gabb.* — Tex.
183. **Neithea quinquenaria**, (*Conr.*) *Gabb.* — Del.
184. **Neithea texana**, (*Roemer*) *Conr.* — Tex.
185. **Neithea Wrightii**, (*Shumard*) *Gabb.* — Tex.
186. **Pecten argillensis**, *Conr.* — Ala.
187. **Pecten burlingtonensis**, *Gabb.* — N. J.; (Ala.?)
188. **Pecten craticula**, *Morton.* — N. J.
189. **Pecten mississippiensis**, *Conr.* — Miss.
190. **Pecten nebrascensis**, *Meek & Hayden.* — Id.
191. **Pecten Neilsoni**, *Goldfuss* (not *Desh.*) — Tex.
192. **Pecten tenuitesta**, *Gabb.* — N. J.
193. **Pecten texanus**, *Gabb.* — Tex.
194. **Pecten venustus**, *Morton.* — N. J.
195. **Sincyclonema rigida**, (*Hall & Meek*) *Meek.* — Dak.
196. **Sincyclonema? simplicus**, (*Conr.*) *Meek.* — N. J.; Ala.; Miss.; Ten.

Nuculanidæ.

197. **Yoldia Evansi**, *Meek & Hayden.* — Id.; Dak.
198. **Yoldia scitula**, *Meek & Hayden.* — Id.; Dak.

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199. **Yoldia subnasuta,** (*Hall & Meek*) *M. & H.* — Dak.
200. **Yoldia ventricosa,** (*Hall & Meek*) *M. & H.* — Dak.
201. **Nuculana bisulcata,** (*Meek & Hayden*) *Meek.* — Id.
202. **Nuculana longifrons,** (*Conr.*) *Meek.* — Ala.; Miss.; N. J.
203. **Nuculana pinnæformis,** (*Gabb*) *Meek.* — N. J.
204. **Nuculana protexta,** (*Gabb*) *Meek.* — N. J.; Ten.
205. **Nuculana Blackiana,** (*Gabb*) *Meek.* — N. J.
206. **Nuculana subangulata,** (*Gabb*) *Meek.* — N. J.
207. **Neilo Hindi,** *Meek.* — Br. Am.

Nuculidæ.

208. **Nucula cancellata,** *Meek & Hayden.* — Dak.
209. **Nucula bellastriata,** *Shumard.* — Tex.
210. **Nucula cuneiformis,** *Conr.* — Miss.
211. **Nucula distorta,** *Gabb.* — Tenn.; Miss.
212. **Nucula? equilateralis,** *Meek & Hayden.* — Dak.
213. **Nucula Haydeni,** *Shumard.* — Tex.
214. **Nucula obsoletistriata,** *Meek & Hayden.* — Dak.
215. **Nucula percrassa,** *Conr.* — Ala.; Miss.
216. **Nucula perequalis,** *Conr.* — Ala.; Miss.; N. J.; Ten.
217. **Nucula planimarginata,** *Meek & Hayden.* — Dak.
218. **Nucula serrata,** *Shumard.* — Tex.
219. **Nucula subplana,** *Meek & Hayden.* — Id.
220. **Nucula Traskana,** *Meek.* — Vanc. I.

Arcidæ.

221. **Limopsis parvula,** *Meek & Hayden.* — Id.
222. **Limopsis striato-punotata,** *Evans & Shumard.* — Dak.
223. **Axinæa hamula,** (*Morton*) *Gabb.* — N. J.; Ala.
224. **Axinæa siouxensis,** (*Hall & Meek*) *M. & H.* — Iowa.
225. **Axinæa subventricosa,** *Meek & Hayden.* — Dak.
226. **Axinæa rotundata,** *Gabb.* — N. J.
227. **Axinæa subaustralis,** (*D'Orb.*) *Gabb.* — Ala.; N. J.
228. **Cucullæa? equilateralis,** *Meek.* — Vanc. I.
229. **Cucullæa antrosa,** *Morton.* — N. J.; Del.; Ala.
230. **Cucullæa exigua,** *Meek & Hayden.* — Id.
231. **Cucullæa maconensis,** *Conr.* — Ala.
232. **Cucullæa nebrascensis,** *Owen.* — Dak.
233. **Cucullæa Shumardi,** *Meek & Hayden.* — Dak.
234. **Cucullæa terminalis,** *Conr.* — Tex.
235. **Cucullæa tippana,** *Conr.* — Ala.
236. **Cucullæa transversalis,** *Gabb.* — N. J.
237. **Cucullæa ungula,** *Tuomey.* — Ala.
238. **Cucullæa vulgaris,** *Morton.* — N. J.; Del.
239. **Arca altirostrata,** *Gabb.* — N. J.
240. **Arca Proutiana,** *Shumard.* — Tex.

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241. **Arca quindecemradiata**, *Gabb.* N. J.; Del.
242. **Arca Saffordi**, *Gabb.* N. J.; Ten.
243. **Arca subelongata**, *Conr.* Tex.
244. **Arca sulcatina**, *Evans & Shumard.* Dak.; Id.
245. **Arca uniopsis**, *Conr.* N. J.
246. **Arca vancouverensis**, *Meek.* Vanc. I.
247. **Cibota lineata**, *Conr.* Ala.; Miss.
248. **Cibota multiradiata**, *Gabb.* N. J.
249. **Cibota rostellata**, (*Morton*) *Gabb.* N. J.

Trigoniidæ.

250. **Trigonia Emoryi**, *Conr.* Tex.
251. **Trigonia Eufalensis**, *Gabb.* N. J.; Ala.; Ten.; Miss.
252. **Trigonia Evansi**, *Meek.* Vanc. I.
253. **Trigonia limbata**, *D'Orb.?* Tex.; Ala.
254. **Trigonia Mooreana**, *Gabb.* Tex.
255. **Trigonia plicatocostata**, *Galeotti.* Mex.
256. **Trigonia texana**, *Conr.* Tex.
257. **Trigonia thoracica**, *Morton.* N. J.; Del.; Ala.; Miss.; Ten.; Tex.

Pinnidæ.

258. **Pinna calamitoides**, *Shumard.* Vanc. I.
259. **Pinna fibrosa**, *Meek & Hayden.* Dak.
260. **Pinna laqueata**, *Conr.* N. J.; Ala.; Miss.
261. **Pinna rostriformis**, *Morton.* N. J.
262. **Pinna? lingula**, *Newberry.* N. M.

Aviculidæ.

263. **Pteria abrupta**, (*Conr.*) *Meek.* N. J.
264. **Pteria convexoplana**, (*Roemer*) *Meek.* Tex.
265. **Pteria cretacea**, (*Conr.*) *Meek.* Ark.
266. **Pteria Haydeni**, (*Hall & Meek*) *Meek.* Dak.
267. **Pteria iridescens**, (*Shumard*) *Meek.* Tex.
268. **Pteria laripes**, (*Morton*) *Meek.* Del.
269. **Pteria linguiformis**, (*Evans & Shumard*) *Meek.* Id.; Dak.; Id.
270. **Pteria nebrascana**, (*Evans & Shumard*) *Meek.* Dak.; Br. Am.
271. **Pteria pedernalis**, (*Roemer*) *Meek.* Tex.
272. **Pteria petrosa**, (*Conr.*) *Meek.* Del.
273. **Pteria planisulca**, (*Roemer*) *Meek.* Tex.
274. **Pteria subgibbosa**, (*Meek & Hayden*) *Meek.* Dak.
275. **Pteria triangularis**, (*Evans & Shumard*) *Meek.* Vanc. I.
276. **Gervillia ensiformis**, *Conr.* N. J.; Ala.
277. **Gervillia gregaria**, *Shumard.* Tex.
278. **Gervillia recta**, *Meek & Hayden.* Dak.
279. **Gervillia subtortuosa**, *Meek & Hayden* Id.
280. **Pulvinites argentea**, *Conr.* Ala.: Miss.
281. **Inoceramus alveatus**, *Morton.* Ala.

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282. **Inoceramus argenteus**, *Conr.* — Ala.
283. **Inoceramus aviculoides**, *Meek.* — Neb.; Dak.; Kans.; Iowa.
284. **Inoceramus Barabini**, *Morton.* — N. J.; Dak.; Ala., &c.
285. **Inoceramus Balchii**, *Meek & Hayden.* — Dak.
286. **Inoceramus capulus**, *Shumard.* — Tex.
287. **Inoceramus confertim-annulatus**, *Roemer.* — Tex.
288. **Inoceramus Conradi**, *Hall & Meek.* — Neb.
289. **Inoceramus convexus**, *Hall & Meek.* — Dak.
290. **Inoceramus Cripsii**, *Mantell?* — Id.; Dak.
291. **Inoceramus cuneatus**, *Meek & Hayden.* — Id.; N. J.
292. **Inoceramus exogyroides**, *Meek & Hayden.* — Id.
293. **Inoceramus fragilis**, *Hall & Meek.* — Neb.
294. **Inoceramus gibbus**, *Tuomey.* — Miss.
295. **Inoceramus incurvus**, *Meek & Hayden.* — Dak.
296. **Inoceramus inflatus**, *Tuomey.* — Ala.
297. **Inoceramus latus**, *Mantell?* — Tex.; Dak.
298. **Inoceramus Larouxii**, *Marcou.* — N. M.
299. **Inoceramus Mortoni**, *Meek & Hayden.* — Dak.
300. **Inoceramus nebrascensis**, *Owen.* — Dak.
301. **Inoceramus perovalis**, *Conr.* — Del.
302. **Inoceramus pertenuis**, *Meek & Hayden.* — Neb.; Id.; N. M.
303. **Inoceramus pseudomytiloides**, *Schiel.* — Ind. T.; Kans.; Neb.
304. **Inoceramus proximus**, *Tuomey.* — Ala.
305. **Inoceramus problematicus**, (*Schlot.*) *D'O.* — Tex.; In.T.; Kans.; Neb.
306. **Inoceramus sagensis**, *Owen.* — Dak.
307. **Inoceramus salæbrosus**, *Tuomey.* — Ala.
308. **Inoceramus Simpsoni**, *Meek.* — Id.
309. **Inoceramus striatus**, *Mantell?* — Tex.
310. **Inoceramus subcompressus**, *Meek & Hayden.* — Id.
311. **Inoceramus sublævis**, *Hall & Meek.* — Dak.
312. **Inoceramus subundatus**, *Meek.* — Vanc. I.
313. **Inoceramus tenuilineatus**, *Hall & Meek.* — Dak.
314. **Inoceramus tenuirostratus**, *Meek & Hayden.* — Id.
315. **Inoceramus texanus**, *Conr.* — Tex.
316. **Inoceramus triangularis**, *Tuomey.* — Ala.
317. **Inoceramus undulo-plicatus**, *Roemer.* — Tex.
318. **Inoceramus undabundus**, *Meek & Hayden.* — Id.
319. **Inoceramus Vanuxemi**, *Meek & Hayden.* — Dak.
320. **Inoceramus [Actinoceramus] costellatus**, *Conr.* — Miss.

Dreissenidæ.

321. **Dreissena tippana**, *Conr.* — Miss.

Mytilidæ.

322. **Lithophagus affinis**, *Gabb.* — N. J.
323. **Lithophagus ripleyanus**, *Gabb.* — Miss.

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324.	**Modiola attenuata**, *Meek & Hayden.*	Dak.
325.	**Modiola concentrico-costellata**, *Roemer.*	Tex.
326.	**Modiola cretacea**, *Conr.*	Ala.
327.	**Modiola Juliæ**, *Lea.*	N. J.
328.	**Modiola Meekii**, *Evans & Shumard.*	Dak.
329.	**Modiola ovata**, *Gabb.*	N. J.
330.	**Modiola pedernalis**, *Roemer.*	Tex.
331.	**Modiola Saffordi**, *Gabb.*	Ten.
332.	**Mytilus [?] simplicatus**, *Roemer.*	Tex.
333.	**Mytilus subarcuatus**, *Meek & Hayden.*	Id.
334.	**Mytilus tenuitesta**, *Roemer.*	Tex.
335.	**Crenella elegantula**, *Meek & Hayden.*	Id.
336.	**Crenella granulato-cancellata**, (*Roemer*) *Meek.*	Tex.
337.	**Crenella (Stalagmium) sericea**, *Conr.*	Ala.

Crassatellidæ.

338.	**Cardita eminula**, *Conr.*	Tex.
339.	**Cardita subquadrata**, *Gabb.*	Ten?
340.	**Cardita subtetrica**, *Conr.*	Tex.
341.	**Crassatella alabamensis**, *D'Orb.*	Ala.
342.	**Crassatella cuneata**, *Gabb.*	Ala.; Ten.
343.	**Crassatella delawarensis**, *Gabb.*	Del.; N. J.
344.	**Crassatella Evansii**, *Hall & Meek.*	Dak.
345.	**Crassatella lintea**, *Conr.*	Ala.; Miss.
346.	**Crassatella lineata**, *Shumard.*	Tex.
347.	**Crassatella monmouthensis**, *Gabb.*	N. J.; Ala.; Ten.
348.	**Crassatella parvula**, *Shumard.*	Tex.
349.	**Crassatella pteropsis**, *Conr.*	Ala.; Miss.
350.	**Crassatella subplana**, *Conr.*	Ala.
351.	**Crassatella transversa**, *Gabb.*	N. J.
352.	**Crassatella vadosa**, *Morton.*	N. J.; Del.; Ala.; Miss.
353.	**Astarte crenulata**, *Conr.*	Ala.; N. J.; Miss.; Ten.
354.	**Astarte gregaria**, *Meek & Hayden.*	Dak.
355.	**Astarte lineolata**, *Roemer.*	Tex.
356.	**Astarte octolyrata**, *Gabb.*	N. J.; Ten.
357.	**Astarte parilis**, *Conr.*	N. J.
358.	**Astarte texana**, *Conr.*	Tex.
359.	**Astarte washitaensis**, *Shumard.*	Tex.; Ind. T.
360.	**? Opis bella**, *Conr.*	Miss.
361.	**? Opis bicarinata**, *Conr.*	Miss.
362.	**? Opis Haleana**, *D'Orb.*	Ala.

Solemyidæ.

363.	**Solemya subplicata**, *Meek & Hayden.*	Dak.

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Kelliidæ.

364. **Kellia cretacea,** *Conr.* — Ala.; Miss.

Diplodontidæ.

365. **Mysia gibbosa,** *Gabb.* — N. J.; Del.
366. **Mysia parilis,** *Conr.* — Ala.; Miss.
367. **Sphærella concentrica,** *Conr.* — Ala.

Lucinidæ.

368. **Lucina occidentalis,** (*Morton*) *Meek & Hayden.* — Id.; Dak.
369. **Lucina parvilineata,** *Shumard.* — Tex.
370. **Lucina pinguis,** *Conr.* — N. J.
371. **Lucina sublenticularis,** *Shumard.* — Tex.
372. **Lucina subundata,** *Hall & Meek.* — Dak.
373. **Lucina ventricosa,** *Meek & Hayden.* — Id.; Dak.

Glossidæ.

374. **Glossus ? moreauensis,** (*Meek & Hayden*) *Gabb.* — Dak.
375. **Glossus washita,** (*Marcou*) *Gabb.* — Tex.
376. **Glossus Conradi,** *Gabb.* — Ala.; N. J.

Cardiidæ.

377. **Papyridea [Liopistha] elegantula,** (*Roemer*) *Conr.* — Tex.
378. **Papyridea [Liopistha] bella,** *Conr.* — Miss.
379. **Papyridea [Liopistha] protexta,** *Conr.* — N. J.
380. **Papyridea (Liopistha) rostrata,** *Meek.* — Ark.
381. **Papyridea ? sancti-sabæ,** (*Roemer*) *Meek.* — Tex.
382. **Cardium abruptum,** *Gabb.* — Ten.
383. **Cardium coloradoense,** *Shumard.* — Tex.
384. **Cardium congestum,** *Conr.* — Tex.
385. **Cardium curtum,** *Meek & Hayden.* — Id.; Utah.
386. **Cardium eufalense,** *Conr.* — Ala.
387. **Cardium hemicylum,** *Tuomey.* — Ala.
388. **Cardium mediale,** *Conr.* — Tex.
389. **Cardium multiradiatum,** *Gabb.* — Ala.; N. J.
390. **Cardium [Acanthocardia] ripleyense,** *Conr.* — Ala.
391. **Cardium [Acanthocardia] speciosum,** *Meek & Hayden.* — Id.
392. **Cardium [Acanthocardia] tippanum,** *Conr.* — Ala.; Miss.
393. **Cardium (Protocardia) arkansense,** *Conr.* — Ark.
394. **Cardium [Protocardia] brazoense,** *Shumard.* — Tex.
395. **Cardium [Protocardia] choctawense,** *Shumard.* — Tex.
396. **Cardium (Protocardia) filosum,** *Conr.* — Tex.
397. **Cardium [Protocardia] multistriatum,** *Shumard.* — Tex.
398. **Cardium [Protocardia ?] pertenue,** *Meek & Hayden.* — Id.
399. **Cardium [Protocardia ?] rarum,** *Evans & Shumard.* — Id.; Dak.
400. **Cardium (Protocardia) scitulum,** *Meek.* — Vanc. I.

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401. **Cardium [Protocardia?] subquadratum,** *Evans & Sh.* Id.; Dak.
402. **Cardium (Protocardia?) texanum,** *Conr.* Tex.
403. **Cardium (Liocardium) Spillmani,** *Conr.* Miss.

Tancrediidæ.

404. **Tancredia americana,** *Meek & Hayden.* Idah.

Cyrenidæ.

405. **Cyrena arenaria,** (*Meek & Hayden*) *Meek.* Neb.; Dak.

Veniliidæ.

406. **Cyprina compressa,** *Meek & Hayden.* Dak.
407. **Cyprina ovata,** *Meek & Hayden.* Dak.
408. **Venilia Conradi,** *Morton.* N. J.
409. **Venilia humilis,** (*Meek & Hayden*) *Meek.* Id.; Dak.
410. **Venilia Gabbana,** *Meek.* N. J.
411. **Venilia Mortoni,** *Meek & Hayden.* Id.
412. **Venilia subtumida,** (*Meek & Hayden*) *Meek.* Id.
413. **Venilia rhomboidea,** *Conr.* N. J.
414. **Venilia trapezoidea,** *Conr.* N. J.; Ala.; Miss.
415. **Venilia trigona,** *Gabb.* N. J.
416. **Venilia Laphami,** (*Shumard*) *Meek.* Tex.

Veneridæ.

417. **Cyclina? circularis,** (*Meek & Hayden*) *Meek.* Id.; Dak.
418. **Dosinia densata,** (*Conr.*) *Gabb.* N. J.
419. **Dosinia depressa,** *Conr.* N. J.; Ala.; Miss.
420. **Dosinia excavata,** (*Morton*) *Conr.* N. J.
421. **Dosinia haddonfieldensis,** *Lea.* N. J.
422. **Dosinia obliquata,** *Conr.* Ala.; Miss.
423. **Dosinia? tenuis,** *Meek.* Vanc. I.
424. **Dione delawarensis,** *Gabb.* Del.
425. **Dione eufalensis,** (*Conr.*) *Meek.* Ala.
426. **Dione Deweyi,** (*Meek & Hayden*) *Meek.* Dak.; Id.
427. **Dione lenonensis,** (*Conr.*) *Meek.* Tex.
428. **Dione lamarensis,** (*Shumard*) *Meek.* Tex.
429. **Dione missouriana,** (*Morton*) *Meek.* Id.; Dak.
430. **Dione nebrascensis,** *Meek & Hayden.* Dak.; Id.
431. **Dione orbiculata,** (*Hall & Meek*) *Meek* Neb.
432. **Dione Owenana,** (*Meek & Hayden*) *Meek.* Id.
433. **Dione? pellucida,** (*Meek & Hayden*) *Meek.* Id.
434. **Dione texana,** (*Conr.*) *Meek.* Tex.
435. **Dione tippana,** (*Conr.*) *Meek.* Ala.; Miss.
436. **Dione [?] Meekana,** (*Gabb*) *Meek.* Miss.
437. **Dione [?] ripleyana,** (*Gabb*) *Meek.* Miss.
438. **Dione [?] tenuis,** (*Hall & Meek*) *Meek.* Neb.
439. **Venus [?] sublamellosa,** *Shumard.* Tex.

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Tellinidæ.

440. **Abra? formosa,** (*Meek & Hayden*) *Meek.* — Dak.
441. **Capsa texana,** *Conr.* — Tex.
442. **Sanguinolaria cretacea,** *Conr.* — Ala.
443. **Tellina? cheyennensis,** *Meek & Hayden.* — Dak.
444. **Tellina eufalensis,** *Conr.* — Ala.
445. **Tellina equilateralis,** *Meek & Hayden.* — Id.
446. **Tellina nitidula,** *Meek & Hayden.* — Id.
447. **Tellina ripleyana,** *Conr.* — Miss.
448. **Tellina scituta,** *Meek & Hayden.* — Dak.
449. **Tellina? subelliptica,** *Meek & Hayden.* — Dak.
450. **Tellina (Tellinimera) eborea,** *Conr.* — Ala.; Miss.
451. **Tellina (Tellinimera) limatula,** *Conr.* — Ala.
452. **Arcopagia [?] texana,** *Roemer.* — Tex.
453. **Linearia metastriata,** *Conr.* — Ala.
454. **Linearia? irradians,** (*Roemer*) *Meek.* — Tex.
455. **Linearia? cancellato-sculpta,** (*Roemer*) *Meek.* — Tex.

Mactridæ.

456. **Mactra alta,** *Meek & Hayden.* — Id.
457. **Mactra formosa,** *Meek & Hayden.* — Id.
458. **Mactra gracilis,** *Meek & Hayden.* — Id.
459. **Mactra siouxensis,** *Meek & Hayden.* — Dak.; Iowa.
460. **Mactra texana,** *Conr.* — Tex.
461. **Mactra Warrenana,** *Meek & Hayden.* — Dak.

Anatinidæ.

462. **Homomya alta,** *Roemer.* — Tex.
463. **Pholadomya elegantula,** *Evans & Shumard.* — Vanc. I.
464. **Pholadomya occidentalis,** *Morton.* — N. J.; Del.; Miss.; Ark.
465. **Pholadomya papyracea,** *Meek & Hayden.* — Id.
466. **Pholadomya pedernalis,** *Roemer.* — Tex.
467. **Pholadomya subventricosa,** *Meek & Hayden.* — Id.
468. **Pholadomya subelongata,** *Meek.* — Vanc. I.
469. **Pholadomya tenua,** *Tuomey.* — Ala.
470. **Pholadomya texana,** *Conr.* — Tex.
471. **Pholadomya tippana,** *Conr.* — Miss.; Ala.
472. **Pholadomya umbonata,** *Roemer.* — Tex.
473. **Pholadomya [Cymella] undata,** *Meek & Hayden.* — Id.
474. **Goniomya americana,** *Meek & Hayden.* — Dak.
475. **Goniomya borealis,** *Meek.* — Vanc. I.
476. **Anatimya anteradiata,** *Conr.* — Miss.
477. **Anatimya postsulcata,** *Conr.* — Miss.
478. **Anatimya papyra,** *Conr.* — Miss.
479. **Neæra alæformis,** *Shumard.* — Tex.

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480. **Neæra fibrosa,** (*Evans & Shumard*) *Meek.* Dak.
481. **Neæra moreauensis,** *Meek & Hayden.* Dak.
482. **Neæra ventricosa,** *Meek & Hayden.* Dak.
483. **Thracia gracilis,** *Meek & Hayden.* Dak.
484. **Thracia occidentalis,** *Meek.* Vanc. I.
485. **Thracia? Prouti,** *Meek & Hayden.* Dak.
486. **Thracia subtortuosa,** *Meek & Hayden.* Dak.
487. **Thracia subtruncata,** *Meek.* Vanc. I.
488. **Periploma applicata,** *Conr.* Miss.
489. **Anatina elliptica,** *Gabb.* N. J.
490. **Anatina sulcatina,** *Shumard.* Tex.

Corbulidæ.

491. **Corbula crassimarginata,** *Meek & Hayden.* Dak.
492. **Corbula crassiplicata,** *Gabb.* N. J.; Ten.
493. **Corbula eufalensis,** *Conr.* Ala.
494. **Corbula Foulkei,** *Lea.* N. J.
495. **Corbula graysonensis,** *Shumard.* Tex.
496. **Corbula Hillgardii,** *Gabb.* Ala.
497. **Corbula inornata,** *Meek & Hayden.* Dak.
498. **Corbula occidentalis,** *Conr.* Tex.
499. **Corbula [?] subcompressa,** *Gabb.* N. J.; Ten.
500. **Corbula Tuomeyi,** *Shumard.* Tex.
501. **Corbulamella gregaria,** *Meek & Hayden.* Dak.

Saxicavidæ.

502. **Panopæa decisa,** (*Conr.*) *Gabb.* N. J.; Del.
503. **Panopæa Newberryi,** *Shumard.* Tex.
504. **Panopæa occidentalis,** *Meek & Hayden.* Dak.
505. **Panopæa subplicata,** *Shumard.* Tex.
506. **Panopæa subparallela,** *Shumard.* Tex.
507. **Panopæa texana,** *Shumard.* Tex.
508. **Panopæa Tuomeyi,** *Gabb.* Ala.
509. **? Pachymya austenensis,** *Shumard.* Tex.

Solenidæ.

510. **Siliquaria biplicata,** *Conr.* Ala.
511. **Siliqua cretacea,** *Gabb.* N. J.
512. **Pharella dakotensis,** *Meek & Hayden.* Iowa.
513. **Legumen appressa,** *Conr.* Ala.; Miss.
514. **Legumen elliptica,** *Conr.* Ala.; Miss.; N. J.
515. **Legumen planata,** *Gabb.* N. J.; Ala.

Gastrochænidæ.

516. **Clavagella armata,** *Morton.* N. J.
517. **Gastrochæna americana,** *Gabb.* N.J.; Ala.

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Teredidæ.

518. **Teredo calamitoides,** *Gabb.* — Ala.
519. **Teredo contorta,** *Gabb.* — N. J.
520. **Teredo globosa,** *Meek & Hayden.* — Dak.
521. **Teredo irregularis,** *Gabb.* — N.J.; Ala.
522. **Teredo selliformis,** *Meek & Hayden.* — Dak.
523. **Teredo tibialis,** *Morton.* — N. J.; Del.
524. **Polarthus americanus,** *Gabb.* — N. J.

Pholadidæ.

525. **Martesia? cuneata,** *Meek & Hayden.* — Dak.
526. **Goniochasma Stimpsoni,** (*Meek & Hayden*) *Meek.* — Dak.
527. **Xylophagella elegantula,** (*Meek & Hayden*) *Meek.* — Dak.
528. **Pholas cithara,** *Morton.* — N. J.
529. **Pholas cretacea,** *Gabb.* — N. J.

Class GASTEROPODA.

Subclass OPISTHOBRANCHIATA.

Order TECTIBRANCHIATA.

Bullidæ.

530. **Bulla macrostoma,** *Gabb.* — Ala.
531. **Bulla minor,** *Meek & Hayden.* — Dak.
532. **Bulla Mortoni,** *Lyell & Forbes.* — N. J.
533. **Bulla nebrascensis,** *Meek & Hayden.* — Id.
534. **Bulla speciosa,** *Meek & Hayden.* — Id.
535. **Bulla volvaria,** *Meek & Hayden.* — Dak.

Cylichnidæ.

536. **Cylichna minuscula,** *Shumard.* — Tex.
537. **Cylichna recta,** *Gabb.* — N. J.
538. **Cylichna scitula,** *Meek & Hayden.* — Dak.
539. **Cylichna secalina,** *Shumard.* — Tex.
540. **Cylichna striatella,** *Shumard.* — Tex.

Ringiculidæ.

541. **Cinulia (Avellana) concinna,** (*Hall & Meek*) *M. & H.* — Dak.
542. **Cinulia (Avellana) pulchella,** (*Shumard*) *Meek.* — Tex.
543. **Cinulia (Avellana) texana,** *Shumard.* — Tex.
544. **Cinulia (?) naticoides,** (*Gabb*) *Meek.* — N. J.
545. **Ringinella subpellucida.** (*Shumard*) *Meek.* — Tex.
546. **Ringinella acutispira,** (*Shumard*) *Meek.* — Tex.

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Actæonidæ.

547. **Solidula attenuata,** *Meek & Hayden.* Id.
548. **Solidula biplicata,** (*Gabb*) *Meek.* N. J.
549. **Solidula [?] bullata,** (*Morton*) *Gabb.* N. J.
550. **Solidula lenta,** *Conrad.* Miss.
551. **Solidula Mortoni,** (*Forbes*) *Gabb.* N. J.
552. **Solidula Riddelli,** *Shumard.* Tex.
553. **Solidula subelliptica,** *Meek & Hayden.* Dak.
554. **Actæon cretacea,** *Gabb.* N. J.
555. **Actæon modicella,** *Conr.* Miss.; Ala.
556. **Actæon ovoidea,** *Gabb.* N. J.
557. **Actæon texana,** *Shumard.* Tex.
558. **Actæonina texana,** (*Roemer*) *Gabb.* Tex.
559. **Bullopsis cretacea,** *Conr.* Miss.
560. **Globiconcha coniformis,** *Roemer.* Tex.
561. **Globiconcha curta,** *Gabb.* N. J.
562. **Globiconcha elevata,** *Shumard.* Tex.; Ind. T.

Subclass PROSOBRANCHIATA.

Order **CYCLOBRANCHIATA.**

?Dentalidæ.

563. **Dentalium fragile,** *Meek & Hayden.* Dak.
564. **Dentalium gracile,** *Hall & Meek.* Dak.
565. **Dentalium nanaimoense,** *Meek.* Vanc. I.
566. **Dentalium pauperculum,** *Meek & Hayden.* Dak.
567. **Dentalium subarcuatum,** *Conr.* N. J.

Patellidæ.

568. **Helcion [?] tentorium,** (*Morton*) *D'Orb.* N. J.

Tecturidæ.

569. **Anisomyon alveatus,** *Meek & Hayden.* Id.
570. **Anisomyon borealis** (*Morton*) *Meek & Hayden.* Dak.
571. **Anisomyon Haydeni,** *Shumard.* Tex.
572. **Anisomyon? inæquicostatus,** (*Shumard*) *Meek.* Tex.
573. **Anisomyon patelliformis,** *Meek & Hayden.* Id.
574. **Anisomyon sexsulcatus,** *Meek & Hayden.* Id.
575. **Anisomyon Shumardi,** *Meek & Hayden.* Dak.
576. **Anisomyon subovatus,** *Meek & Hayden.* Id.
577. **Tectura? occidentalis,** (*Hall & Meek*) *Meek.* Dak.
578. **Tectura? papillata,** *Meek & Hayden.* Dak.
579. **Tectura? parva,** *Meek & Hayden.* Dak.

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580. **Delphinula [?] lapidosa,** *Morton.* — N. J.; Del.
581. **Straparollus [?] lapidosus,** *Gabb.* — Ala.
582. **Straparollus [?] subplanus,** *Gabb.* — Ala.

Order RHIPIDOGLOSSATA.

Phasianellidæ.

583. **Eutropia Haleana,** (*D'Orb.*) *Meek.* — Ala.
584. **Eutropia perovata,** *Shumard.* — Tex.
585. **Eutropia [?] punctata,** *Gabb.* — N. J.

Pleurotomariidæ.

586. **Pleurotomaria austenensis,** *Shumard.* — Tex.
587. **Pleurotomaria [?] crotaloides,** (*Morton*) *D'Orb.* — Ala.

Trochidæ.

588. **Margaritella Abbotti,** (*Gabb*) *Meek.* — N. J.
589. **Margaritella flexistriata,** (*Evans & Shumard*) *M. & H.* — Id.; Dak.
590. **Margarita abyssinis,** (*Gabb*) *Meek.* — N. J.
591. **Trochus Mortoni,** *Gabb.* — Ala.

Neritidæ.

592. **Neritella (Nereis) densata,** (*Conr.*) *Meek.* — Miss.

Order CTENOBRANCHIATA.

Vanikoridæ.

593. **Vanikoro ambigua,** (*Meek & Hayden*) *Meek.* — Dak.
594. **Neritopsis? Tuomeyana,** *Meek & Hayden.* — Id.

Capulidæ.

595. **? Thylacus cretacea,** *Conr.* — Ala.

Phoridæ.

596. **Phorus leprosus,** (*Morton*) *Gabb.* — N. J.; Ala.
597. **Phorus? umbilicatus,** *Tuomey.* — Miss.

Turritellidæ.

598. **Turritella altilis,** *Conr.* — Miss.
599. **Turritella corsicana,** *Shumard.* — Tex.
600. **Turritella encrinoides,** *Morton.* — N. J.; Ala.; Miss.
601. **Turritella granulicostata,** *Gabb.* — N. J.
602. **Turritella fastigata,** *Tuomey.* — Ala.
603. **Turritella hardemanensis,** *Gabb.* — N. J.
604. **Turritella irrorata,** *Conr.* — Tex.; Ind. T.

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605. **Turritella leonensis,** *Conr.* T
606. **Turritella multilineata,** *Evans & Shumard.* D.
607. **Turritella pumila,** *Gabb.* Te
608. **Turritella Saffordii,** *Gabb.* Te
609. **Turritella seriatim-granulata,** *Roemer.* T
610. **Turritella tennesseensis,** *Gabb.* Te
611. **Turritella tippana,** *Conrad.* Mi
612. **Turritella trilira,** *Conr.* Miss.; A
613. **Turritella vertebroides,** *Morton.* N. J.; Ala.; Mi
614. **Turritella Winchelli,** *Shumard.* T

Littorinidæ.

615. **Spironema tenuiliniata,** (*Meek & Hayden*) ***Meek.*** D
616. **Spironema bella,** (*Conr.*) *Meek.* A

Cerithiidæ.

617. **Cerithium bosquense,** *Shumard.* T
618. **Cerithium Bustamentii,** *Galeotti.* M
619. **Cerithium cingulatum,** *Galeotti.* M
620. **Cerithium subminutum,** *D'Orb.* M
621. **Cerithium [?] suturosum,** *Galeotti.* M
622. **Cerithium nodosum,** *Tuomey.* A

Aporrhaidæ.

623. **Anchura abrupta,** *Conr.* A
624. **Anchura? biangulata,** (*Meek & Hayden*) ***Meek.***
625. **Anchura? parva,** (*Meek & Hayden*) ***Meek.***
626. **Anchura? sublævis,** (*Meek & Hayden*) ***Meek.***
627. **Anchura (Drepanochilus) americana,** (*E. & S.*) *Meek.* Dak.;
628. **Anchura (Drepanochilus) decemlirata,** (*Conr.*) *Meek.* A
629. **Anchura (Drepanochilus) nebrascensis,** (*E. & S.*) *Mk.* Dak.;
630. **Anchura (Drepanochilus) rostrata,** (*Gabb*) ***Meek.*** N.

Cancellariidæ.

631. **Cancellaria [?] eufalensis,** *Gabb.* A
632. **Cancellaria [?] septemlirata,** *Gabb.* N.
633. **Morea cancellaria,** *Conr.* Mi
634. **Morea naticella,** *Gabb.* N.
635. **Turbinopsis [?] alabamensis,** *Gabb.* A
636. **Turbinopsis depressus,** *Gabb.* N. J.; D
637. **Turbinopsis Hilgardi,** *Conr.* Miss.; A

Trichotropidæ.

638. **Trichotropis [?] cancellaria,** *Conr.* Mi

Cypræidæ.

639. **Cypræa Mortoni,** *Gabb.* Ala.; N.

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Strombidæ.

640.	**Rostellaria [?] arenarum,** *Morton.*	N. J.; Ala.
641.	**Rostellaria ? cheyennensis,** *M. & H.*	Dak.
642.	**Rostellaria [?] pennata,** *Morton.*	Del.; N. J.; Ala.
643.	**Isopleurus curviliratus,** (*Conr.*) *Meek.*	Miss.
644.	**Isopleurus Meekianus,** (*Gabb*) *Meek.*	Ala.
645.	**Pugnellus densatus,** *Conr.*	Ala.; Miss.
646.	**Pterocerella tippana,** (*Conr.*) *Meek.*	Miss.
647.	**Pterocerella ? macrodactyla,** (*Troost*) *Meek.*	Tenn.

Conidæ.

648.	**Conus canalis,** *Conr.*	Ala.

Cerithiopsidæ.

649.	**Cerithiopsis moreauensis,** *Meek & Hayden.*	Dak.

Terebridæ.

650.	**Terebra [?] minuta,** *Galeotti.*	Mex.

Pyramidellidæ.

651.	**Chemnitzia corona,** *Conr.*	Miss.
652.	**Chemnitzia [?] gloriosa,** *Roemer.*	Tex.
653.	**Chemnitzia ? interrupta,** *Conr.*	Miss.
654.	**Chemnitzia laqueata,** *Conr.*	Miss.
655.	**Chemnitzia melanopsis,** *Conr.*	Miss.
656.	**Chemnitzia [?] occidentalis,** *Gabb.*	Ind. T.
657.	**Chemnitzia [?] Spillmani,** *Gabb.*	Miss.
658.	**Chemnitzia ? texana,** (*Roemer*) *Meek.*	Tex.

Scalidæ.

659.	**Scala annulata,** (*Morton*) *Gabb.*	N. J.
660.	**Scala bicarinifera,** *Shumard.*	Tex.
661.	**Scala (Acirsa) cerithiformis,** *Meek & Hayden.*	Dak.
662.	**Scala Forshayii,** (*Shumard*) *Meek.*	Tex.
663.	**Scala lamarensis,** *Shumard.*	Tex.
664.	**Scala Sillimani,** (*Morton*) *Gabb.*	N. J.; Ala.

Cassididæ.

665.	**Sconsia alabamensis,** *Gabb.*	Ala.

Naticidæ.

666.	**Amauropsis paludinæformis,** (*Hall & Meek*) *M. & H.*	Dak.
667.	**Lunatia ? altispira,** *Gabb.*	N. J.
668.	**Lunatia ? acutispira,** (*Shumard*) *Meek.*	Tex.
669.	**Lunatia concinna,** (*Hall & Meek*) *Meek & Hayden.*	Dak.
670.	**Lunatia Halli,** *Gabb.*	N. J.

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671. **Lunatia moreauensis,** *Meek & Hayden.* Dak.
672. **Lunatia obliquata,** (*Hall & Meek*) *Meek & Hayden.* Id.; Dak.
673. **Lunatia occidentalis,** *Meek & Hayden.* Id.; Dak.
674. **Lunatia texana,** (*Conr.*) *Gabb.* Tex.
675. **Gyrodes Abbotti,** *Gabb.* N. J.
676. **Gyrodes alveata,** *Conr.* Miss.
677. **Gyrodes crenata,** *Conr.* Miss.
678. **Gyrodes? obtusivolva,** *Gabb.* N. J.
679. **Gyrodes petrosa** (*Morton*) *Gabb.* N. J.
680. **Gyrodes Spillmanii,** *Gabb.* Miss.
681. **Natica [?] pedernalis,** *Roemer.* Tex.
682. **Natica [?] praegrandis,** *Roemer.* Tex.

Volutidæ.

683. **Volutilithes [?] Abbottii,** *Gabb.* N. J.
684. **Volutilithes [?] cretacea,** *Conr.* Ala.; Miss.
685. **Volutilithes eufalensis,** *Conr.* Ala.
686. **Volutilithes [?] navarroensis,** *Shumard.* Tex.
687. **Volutilithes Saffordi,** *Gabb.* Ten.
688. **Volutilithes (Athleta) leioderma,** *Conr.* Ala.
689. **Rostellites bellus,**(*Gabb*) *Meek.* N. J.
690. **Rostellites biplicatus,**(*Gabb*) *Meek.* N. J.
691. **Rostellites Conradi,** (*Gabb*) *Meek.* N. J.
692. **Rostellites nasutus,**(*Gabb*) *Meek.* N. J.
693. **Rostellites texanus,***Conr.* Tex.
694. **Voluta cancellata,** *Tuomey.* Ala.
695. **Voluta? delawarensis,** *Gabb.* Del.
696. **Voluta Kanei,** *Gabb.* N. J.
697. **Voluta mucronata,** *Gabb.* N. J.
698. **Voluta Spillmani,** *Tuomey.* Ala.
699. **Voluta subjugosa,** *Gabb.* Ala.
700. **Voluta Tuomeyana,** *Gabb.* Ala.

Turbinellidæ.

701. **Turbinella parva,** *Gabb.* N. J.
702. **Turbinella subconica,** *Gabb.* N. J.

Fasciolariidæ.

703. **Fasciolaria buccinoides,** *Meek & Hayden.* Dak.
704. **Fasciolaria? cretacea,** *Meek & Hayden.* Dak.
705. **Fasciolaria Saffordi,** *Gabb.* Ten.
706. **Fasciolaria Slackii,** *Gabb.* N. J.

Purpuridæ.

707. **Rapa pyruloidea,** *Gabb.* N. J.
708. **Rapa supraplicata,** *Conr.* Miss.
709. **Purpuroidea? dubia,** *Gabb.* N. J.

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Buccinidæ.

710. **Buccinum constrictum,** (*Hall & Meek*) *Meek & Hayden.* Dak.
711. **Pseudobuccinum nebrascense,** *Meek & Hayden.* Dak.
712. **? Buccinopsis Parryi,** *Conr.* Tex.

Tritoniidæ.

713. **Trachytriton vinculum,** (*Hall & Meek*) *Meek.* Dak.

Pleurotomidæ.

714. **Daphnella? eufalensis,** *Conr.* Ala.
715. **Daphnella? lintea,** *Conr.* Ala.
716. **Daphnella? subfilosa,** *Conr.* Ala.
717. **Drillia [?] distans,** *Conr.* Ala.; Miss.
718. **Drillia novemcostata,** *Conr.* Miss.
719. **Drillia? tippana,** *Conr.* Miss.
720. **Turris minor,** (*Evans & Shumard*) *Meek & Hayden.* Dak.
721. **Turris texanus,** (*Shumard*) *Meek.* Tex.
722. **Turris [Surcula] contortus** *Meek & Hayden.* Dak.

Muricidæ.

723. **Clavellithes (Piestochilus) Scarboroughi,** (*M. & H.*) *Meek.* Dak.
724. **Cantharus? Vaughani,** (*Meek & H.*) *Meek.* Dak.
725. **Pyrifusus bellaliratus** *Conr.* MSS. Miss.
726. **Pyrifusus? flexicostatus** (*Meek & Hayden*) *Meek.* Id.
727. **Pyrifusus? Haleanus,** (*D'Orb.*) *Meek.* Ala.
728. **Pyrifusus? impressus** (*Gabb*) *Meek.* Ten.
729. **Pyrifusus intertextus** (*Meek & Hayden*) *Meek.* Id.
730. **Pyrifusus Newberryi,** (*Meek & Hayden*) *Meek.* Id.; Dak.
731. **Pyrifusus subdensatus,** *Conr.* Miss.
732. **Pyrifusus subturritus** (*Meek & Hayden*) *Meek.* Dak.
733. **Strepsidura ripleyana,** *Conr.* Miss.
734. **Tritonifusus? tenuilineatus,** (*Hall & Meek*) *Meek.* Dak.
735. **Fusus [?] alabamensis,** *D'Orb.* Ala.
736. **Fusus Culbertsoni,** *Meek & Hayden.* Dak.
737. **Fusus [?] eufalensis,** *Tuomey.* Ala.
738. **Fusus Galpinianus,** *Meek & Hayden.* Dak.
739. **Fusus Holmesianus,** *Gabb.* Ala.
740. **Fusus mullicaensis,** *Gabb.* N. J.
741. **Fusus nebrascensis,** *Evans & Shumard.* Dak.
742. **Fusus novemliratus,** *Conr.* Miss.
743. **Fusus pedernalis,** *Roemer.* Tex.
744. **Fusus [?] retifer,** *Gabb.* N. J.
745. **Fusus Shumardi,** *Hall & Meek.* Dak.
746. **Fusus [?] tippanus,** *Conr.* Ala.
747. **Tudicla trochiformis,** (*Tuomey*) *Gabb.* Ala.

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748. **Tudiola (Pyropsis) Bairdi,** (*M. & H.*) *Meek.* Dak.
749. **Tudiola (Pyropsis) perlata,** *Conr.* Miss.
750. **Tudicla elevata,** *Gabb.* N. J.
751. **Tudicla? dakotensis,** (*M. & H.*) *Meek.* Dak.
752. **Perrissolax? brevissima,** (*D'O.*) *Gabb.* Ala.
753. **Perrissolax octolyrata,** (*Conr.*) *Gabb.* Ala.; Miss.; N. J.
754. **Perrissolax trivolva,** *Gabb.* N. J.
755. **Perrissolax [?] Richardsoni,** (*Tuomey*) *Gabb.* Ala.

Class CEPHALOPODA.

Order TETRABRANCHIATA.

Ammonitidæ.

756. **Baculites anceps,** *Lamarck?* Ala.; Ten.; Del.; Tex., &c.
757. **Baculites annulatus,** *Conr.* Tex.
758. **Baculites asper,** *Morton.* Ala.
759. **Baculites asperoides,** *Meek & Hayden.* Id.
760. **Baculites baculus,** *Meek & Hayden.* Id.; Dak.
761. **Baculites carinatus,** *Morton.* Ala.
762. **Baculites chickoensis,** *Trask.* Cal.
763. **Baculites compressus,** *Say.* Dak.; Id.
764. **Baculites gracilis,** *Shumard.* Tex.
765. **Baculites grandis,** *Hall & Meek.* Dak.
766. **Baculites labyrinthicus,** *Morton.* Ala.
767. **Baculites occidentalis,** *Meek.* Vanc. I.
768. **Baculites ovatus,** *Say.* Dak.; Id.; N. J.; Ala.; Miss., &c.
769. **Ptychoceras (Solenoceras) annulifer,** *Morton.* N. J.; Ala.
770. **Ptychoceras Leai,** (*Troost*) *Meek.* Ten.
771. **Ptychoceras Mortoni,** *Meek & Hayden.* Dak.
772. **Ptychoceras texana,** *Shumard.* Tex.
773. **Ptychoceras Verneuilii,** (*Troost*) *Meek.* Ten.
774. **Hamites [?] arculus,** *Morton.* Ala.
775. **Hamites [?] columna,** (*Morton*) *D'Orb.* Ala.
776. **Hamites Fremonti,** *Marcou.* Tex.
777. **Hamites larvatus,** *Conr.* Tex.
778. **Hamites rotundatus,** *Conr.* Tex.
779. **Hamites [?] torquatus,** *Morton.* Ala.
780. **Hamites [?] vertebralis,** *Morton.* Ala.
781. **Ancyloceras annulatus,** *Shumard.* Tex.
782. **Ancyloceras? approximans,** *Conr.* Ark.
783. **Ancyloceras [?] Nicolleti,** *Hall & Meek.* Dak.
784. **Ancyloceras uncus,** *Meek & Hayden.* Dak.
785. **Scaphites abyssinus,** (*Morton*) *Meek & Hayden.* Dak.
786. **Scaphites cheyennensis,** (*Owen*) *Meek & Hayden.* Dak.

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787. **Scaphites Conradi,** (*Morton*) *D'Orb.* N. J.; Del.; Ala.; Miss.; Dak.; Id.
788. **Scaphites Nicolletii,** (*Morton*) *Meek & Hayden.* Dak.; Id.
789. **Scaphites hippocrepis,** *DeKay.* Del.; N. J.
790. **Scaphites larviformis,** *Meek & Hayden.* Dak.; Id.; Neb.; N. Mex.
791. **Scaphites mandanensis,** (*Morton*) *Meek & Hayden.* Dak.
792. **Scaphites nodosus,** *Owen.* Id.; Dak.
793. **Scaphites nodosus,** *var.* **brevis,** *Meek & Hayden.* Id.; Dak.
794. **Scaphites nodosus,** *var.* **exilis,** *Meek & Hayden.* Id.
795. **Scaphites nodosus,** *var.* **quadrangularis,** *Meek & Hayden.* Id.
796. **Scaphites nodosus,** *var.* **plenus,** *Meek & Hayden.* Id.
797. **Scaphites semicostatus,** *Roemer.* Tex.
798. **Scaphites texanus,** *Roemer.* Tex.
799. **Scaphites vermicularis,** *Shumard.* Tex.
800. **Scaphites vermiformis,** *Meek & Hayden.* Dak.
801. **Scaphites verrucosus,** *Shumard.* Tex.
802. **Scaphites ventricosus,** *Meek & Hayden.* Id.
803. **Scaphites Warreni,** *Meek & Hayden.* Dak.
804. **Trigonellites cheyennensis,** (*Meek & Hayden*) *Gabb.* Dak.
805. **Trigonellites fragilis,** (*Meek & Hayden*) *Gabb.* Dak.
806. **Ceratites americanus** *Harper.* Ala.
807. **Ammonites acutocarinatus,** *Shumard.* Tex.
808. **Ammonites angustus** *Tuomey.* Ala.
809. **Ammonites Belknapii,** *Marcou.* Tex.
810. **Ammonites Barnstoni,** *Meek.* (Placed provis. in Crt. List.) Brit. Am.
811. **Ammonites Billingsi,** *Meek.* " " Brit. Am.
812. **Ammonites chickoensis,** *Trask.* Cal.
813. **Ammonites complexus,** *Hall & Meek.* Dak.; N. J.
814. **Ammonites delawarensis,** *Morton.* Del.; N. J.; Ala.
815. **Ammonites dentato-carinatus,** *Roemer.* Tex.
816. **Ammonites flacidicosta,** *Roemer.* Tex.
817. **Ammonites Galpini,** *Evans & Shumard.* Dak.
818. **Ammonites geniculatus,** *Conr.* Tex.
819. **Ammonites Gibbonianus,** *Lea?* Tex.
820. **Ammonites guadalupae,** *Roemer.* Tex.
821. **Ammonites Graysonensis,** *Shumard.* Tex.
822. **Ammonites Halli,** *Meek & Hayden.* Id.
823. **Ammonites inequiplicatus,** *Shumard.* Tex.
824. **Ammonites leonensis,** *Conr.* Tex.
825. **Ammonites lobatus,** *Tuomey.* Ala.; N. J.; Dak.
826. **Ammonites magnificus,** *Tuomey.* Ala.
827. **Ammonites Marcoanus,** *Shumard.* Tex.
828. **Ammonites Meekianus,** *Shumard.* Tex.
829. **Ammonites Meekii,** *Gabb.* Ala.
830. **Ammonites Mullananus,** *Meek & Hayden.* Id.
831. **Ammonites Newberryanus,** *Meek.* Vanc. I.

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832. **Ammonites novimexicanus,** *Marcou.* Tex.; N. M.
833. **Ammonites opalis,** *Owen.* Dak.
834. **Ammonites pedernalis,** *Von Buch.* Tex.
835. **Ammonites percarinatus,** *Hall & Meek.* Neb.; Dak.; Id.; N. M.
836. **Ammonites peruvianus,** *Von Buch?* Tex
837. **Ammonites placenta,** *DeKay.* N. J.; Del.; Ala.; Miss.; Ten.; N. M
838. **Ammonites placenta,** *var.* **intercalaris,** *Meek & Hayden.* Dak.
839. **Ammonites pleuricepta,** *Conr.* Tex.
840. **Ammonites ramosus,** *Meek.* Vanc. I.
841. **Ammonites ramosissimus,** *Tuomey.* Ala.
842. **Ammonites [?] reconditus,** *Galeotti.* Mex.
843. **Ammonites Rioli,** *Galeotti.* Mex.
844. **Ammonites Shumardi,** *Marcou.* Tex.
845. **Ammonites Sillimani,** *D'Orb.* Id.?
846. **Ammonites Swallovii,** *Shumard.* Tex.
847. **Ammonites syrtalis,** *Morton.* Ala.
848. **Ammonites Tuomeyi,** *Gabb.* Ala.
849. **Ammonites vancouverensis,** *Meek.* Vanc. I.
850. **Ammonites vespertinus,** *Morton.* Ark.; Ind. T.; N. M.; Ind. T.; Tex.
851. **Helicoceras Conradi,** (*Morton*) *Gabb.* N. J.
852. **Helicoceras cochleatum,** *Meek & Hayden.* Dak.
853. **Helicoceras navarroensis,** *Shumard.* Tex.
854. **Helicoceras Mortoni,** (*Hall & Meek*) *Meek & Hayden.* Dak.
855. **Helicoceras? tenuicostatum,** *Meek & Hayden.* Dak.
856. **Helicoceras? nebrascensis,** *Meek & Hayden.* Dak.
857. **Helicoceras? umbilicatum,** *Meek & Hayden.* Dak.
858. **Heteroceras Oweni,** *Meek.* Ark.
859. **Heteroceras tortum,** (*Meek & Hayden*) *Meek.* Dak.
860. **Heteroceras? angulatum,** (*Meek & Hayden*) *Meek.* Dak.
861. **Heteroceras? cheyennensis,** (*Meek & Hayden*) *Meek.* Dak.
862. **Turrilites attenuatus,** *Tuomey.* Ala.
863. **Turrilites brazoensis,** *Roemer.* Tex.
864. **Turrilites helicinus,** *Shumard.* Tex.
865. **Turrilites spiniferus,** *Conr.* Ala.
866. **Turrilites splendidus,** *Shumard.* Tex.

Nautilidæ.

867. **Nautilus angulus,** *Tuomey.* Ala.
868. **Nautilus Campbelli,** *Meek.* Vanc. I.
869. **Nautilus DeKayi,** *Morton.* N. J.; Del.; Ala.; Miss.; Ten.; Ark.; Tex.; Neb.; Id.; Brit. Am.
870. **Nautilus elegans,** *Sowerby?* Tex.; Id.
871. **Nautilus elegans,** var. **nebrascensis,** *Meek & Hayden.* Id.
872. **Nautilus Spillmani,** *Tuomey.* Ala.
873. **Nautilus texanus,** *Shumard.* Tex.
874. **? Aturia orbiculata,** (*Tuomey*) *Meek.* Ala.

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Order **DIBRANCHIATA.**

Belemnitidæ.

875 = **Belemnitella bulbosa,** *Meek & Hayden.* — Dak.
876 = **Belemnitella paxillosa,** (*Lamk.*) *Meek.* — N. J.; Del.; Miss.; Ala.; Tex., &c.

Teuthidæ.

877. **Phylloteuthis subovatus,** *Meek & Hayden.* — Dak.

SUBKINGDOM **ARTICULATA.**

CLASS **ANNULATA.**

Order **TUBICOLA.**

Serpulidæ.

878. **Hamulus major,** *Gabb.* — Ala.
879. **Hamulus onyx,** *Morton.* — Ala.
880. **Hamulus squamosus,** *Gabb.* — Ala.
881. **Serpula ? tenuicarinata,** *Meek & Hayden.* — Dak.
882. **Serpula barbata,** *Morton.* — N. J.
883. **Spirulæa rotula,** (*Morton*) *Meek.* — N. J.

CLASS **CRUSTACEA.**

SUBCLASS ENTOMOSTRACA.

Order **LOPHYROPODA.**

Cytheridæ.

884. **Cytherina tippana,** *Conr.* — Miss.

SUBCLASS DECAPODA.

Order **MACRURA.**

Callianassidæ.

885. **Callianassa Danai,** *Hall & Meek.* — Dak.

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OF THE

INVERTEBRATE FOSSILS OF NORTH AMERICA.

JURASSIC FORMATION.

BY

F. B. MEEK.

SUBKINGDOM **RADIATA.**

CLASS **ECHINODERMATA.**

Order **CRINOIDEA.**

Pentacrinidæ.

886. **Pentacrinus asteriscus,** *Meek & Hayden.* Dak.; Id.; Col.

SUBKINGDOM **MOLLUSCA.**

CLASS **BRACHIOPODA.**

Lingulidæ.

887. **Lingula brevirostra,** *Meek & Hayden.* Dak.

Rhynchonellidæ.

888. **Rhynchonella ——————?** Dak.

CLASS **LAMELLIBRANCHIATA.**

Ostreidæ.

889. **Gryphæa calceola,** *Quenstedt?* Dak.; Id.
890. **Ostrea Engelmanni,** *Meek.* Dak.; Id.

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Pectinidæ.

891. **Camptonectes bellistriatus,** *Meek.* Id.
892. **Camptonectes? extenuatus,** (*Meek & Hayden*) *Meek.* Dak.

Arcidæ.

893. **Grammatodon inornatus,** *Meek & Hayden.* Dak.

Trigoniidæ.

894. **Trigonia Conradi,** *Meek & Hayden.* Dak.

Pteriidæ.

895. **Eumicrotis curta,** (*Hall*) *Meek.* Dak.; Id.
896. **Pteria (Oxytoma) Munsteri,** (*Bronn?*) *Meek.*

Mytilidæ.

897. **Volsella pertenuis,** (*Meek & Hayden*) *Meek.* Id.
898. **Volsella formosa,** (*Meek & Hayden*) *Meek.* Id.

Astartidæ.

899. **Astarte fragilis,** *Meek & Hayden.* Dak.
900. **Astarte inornata,** *Meek & Hayden.* Dak.

Cardiidæ.

901. **Cardium (Protocardia?) Shumardi,** *Meek & Hayden.* Id.

Tancredidæ.

902. **Tancredia Warrenana,** *Meek & Hayden.* Id.
903. **Tancredia? æquilateralis,** *Meek & Hayden.* Id.

Anatinidæ.

904. **Pholadomya humilis,** *Meek & Hayden.* Id.
905. **Myacites subellipticus,** *Meek & Hayden.* Id.
906. **Myacites nebrascensis,** *Meek & Hayden.* Id.
907. **Myacites unionoides,** (*Roemer*) *Meek.* Russ. Am.
908. **Thracia? arcuata,** *Meek & Hayden.* Id.
909. **Thracia? sublævis,** *Meek & Hayden.* Id.

Class GASTEROPODA.

Subclass PULMONIFERA.

Order INOPERCULATA.

Limnæidæ.

910. **Planorbis vetermus,** *Meek & Hayden.* Id.

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Subclass PROSOBRANCHIATA.

Order **CYCLOBRANCHIATA.**

911. **Dentalium subquadratum,** *Meek & Hayden.* Id.

Order **SCUTIBRANCHIATA.**

Neritidæ.

912. **Neritella nebrascensis,** *Meek & Hayden.* Id.

Order **PECTINIBRANCHIATA.**

Valvatidæ.

913. **Valvata scabrida,** *Meek & Hayden.* Id.

Viviparidæ.

914. **Lioplacodes veterna,** (*Meek & Hayden*) *Meek.* Id.

Class **CEPHALOPODA.**

Order **TETRABRANCHIATA.**

Ammonitidæ.

915. **Ammonites biplex,** *Sowerby?* Russ. Am.
916. **Ammonites cordiformis,** *Meek & Hayden.* Id.
917. **Ammonites Henryi,** *Meek & Hayden.* Id.
918. **Ammonites Wosnessenskii,** *Grewingk.* Russ. Am.

Order **DIBRANCHIATA.**

Belemnitidæ.

919. **Belemnites densus,** *Meek & Hayden.* Dak.; Id.
920. **Belemnites.** Russ. Am.

Subkingdom **ARTICULATA.**

Class **ANNULATA.**

Order **TUBICOLA.**

Serpulidæ.

921. **Serpula** (ined.). Id.; Dak.

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NOTES AND EXPLANATIONS.

(CRETACEOUS.)

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3 = **Planularia cuneata,** MORTON, Jour. Acad. Nat. Sci. VIII, 214, pl. xi, fig. 5.

4 = **Palmula sagittaria,** LEA, Am. Phil. Soc. 1833, Contrib. Geol. pl vi, p. 218. Dr. Carpenter unites *Cristellaria, Flabellina, Dentalina, Nodosaria,* &c. as members of a single genus, for which he uses the name *Nodosarina.* It may be at least convenient however, to retain these names in a subgeneric sense; but, in either case, we should think Montfort's older name *Phonemus,* should stand for the entire group.

6 and 7 — I have not been able to find by whom these two species were described, but believe it was by Ehrenburg.

8 = **Orbitulites texanus,** ROEMER, Kreid. Von. Tex. 86.

12 = **Grammostomum phyllodes,** EHRENBURG.

168 = **Plagiostoma echinatum,** MORTON, Synop. Org. Rem. (Add. Obs.) 1835.—3 = **Spondylus capax,** CONRAD, Jour. Acad. Nat. Sci. II, sec. ser. 1850, 274, xxiv, 8.

171 = **Ctenoides acutilineata,** CONRAD, Jour. Acad. Nat. Sci. sec. ser. III, 329, xxiv, 2.

173 = **Ctenoides denticulata,** GABB, Proc. Acad. Nat. Sci. Oct. 1861, 327.

175 = **Plagiostoma pelagicum,** MORTON, Synop. Org. Rem. 1834, 61, v, 2.

177 = **Ctenoides squarrosa,** GABB, Proc. Acad. Nat. Sci. Nov. 1860, 366.

195 = **SYNCYCLONEMA,** MEEK. Type **Pecten rigida,** HALL & MEEK, Mem. Am. Acad. Arts and Sci. Boston, V, new ser. 381, ii, 4, *a, b, c* (not SOWERBY, 1818). The type of this group is a very small, nearly equivalve, ovate-suborbicular, compressed shell, with small, flat, slightly unequal ears, and closed margins. Hinge short; surface with fine, obscure concentric striæ, and sometimes on the right valve, small rounded concentric ridges.

Some of the larger smooth Cretaceous and Jurassic species may possibly also belong to this group. None of the so-called *Pectens,* of the Cretaceous or older rocks, belong properly to the genus *Pecten,* Müller, as typified by the recent *P. maximus,* Linn.

201 = **Leda bisulcata,** MEEK & HAYDEN, Proc. Acad. Nat. Sci. Phila. Dec. 1861, 440.

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202 = **Leda longifrons**, Conrad, Jour. Acad. Nat. Sci. sec. ser. IV, 281, xlvi, 18.

203 = **Leda pinnæformis**, Gabb, ib. 303, xlviii, 22.

204 = **Leda protexta**, Gabb, ib. 23.

205 = **Leda Slackiana**, Gabb, ib. 397, lxviii, 36.

206 = **Leda subangulata**, Gabb, Synop. Mol. Cret. 1861, 133.

263 = **Avicula abrupta**, Conrad, Jour. Acad. Nat. Sci. sec. ser. II, 274, v, 6.

264 = **Avicula convexo-plana**, Roemer, Kreid. Von. Tex. 1852, 61, vii, 9.

265 = **Avicula cretacea**, Conrad, Nicollett's Report, 1845, 169.

266 = **Avicula Haydeni**, Hall & Meek, Mem. Am. Acad. Arts and Sci. sec. ser. V, 382, 1–5.

267 = **Avicula iridescens**, Shumard, Proc. Boston Soc. Nat. Hist. Sept. 1861.

268 = **Avicula laripes**, Morton, Synop. Org. Rem. 1834, 63, xvii, 5.

269 = **Avicula linguiformis**, Evans & Shumard, Proc. Acad. Nat. Sci. Phila. 1855, 163.

270 = **Avicula nebrascana**, Evans & Shumard, Trans. St. Louis Acad. I, 38.

271 = **Avicula pedernalis**, Roemer, Kreid. Von. Tex. 1852, 62, viii, i.

272 = **Avicula petrosa**, Conrad, Jour. Acad. Nat. Sci. sec. ser. II, 174, xxiv, 15.

273 = **Avicula planisulca**, Roemer, Kreid. Von. Tex. 1852, 62, vii, 7.

274 = **Avicula subgibbosa**, Meek & Hayden, Proc. Acad. Nat. Sci. Phila. 1860, 180.

275 = **Avicula triangularis**, Evans & Shumard, ib. 1855, 163.

320 = **ACTINOCERAMUS**, Meek. Type **Inoceramus sulcatus**, Parkinson, Geol. Tr. V, 59. This name is proposed for a small section of *Inocerami*, with a short hinge, and radiating plications or costæ.

324 — This and the following species, placed in the catalogue under the name *Modiola*, belong to *Volsella*, Scopoli, 1777, and should be called *Volsella attenuata*, *V. concentrico-costellata*, &c. They also belong to *Perna*, Adanson, 1757, if his genus should be adopted with the first species as its type.

336 = **Modiola granulato-cancellata**, Roemer, Kreid. Von. Tex. 1852, 54, vii, 12.

377 = **LIOPISTHA**, Meek. Type **Cardium elegantulum**, Roemer, Kreid. Von. Tex. 1852, 48, 5.

The shells embraced in this group, which seems to be peculiar to the Cretaceous system, have, according to Mr. Conrad, the hinge of *Papyridea*, Swainson. They differ, however, from the type of that genus (*Cardium bullatum*, Linn.) in being closed and without costæ on the postero-dorsal region, or crenulations

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in the posterior margins of the valves. They are also much thinner shells.

380 = **Corbula** (sp. ined.), OWEN, Second Rept. Geol. Survey Arkansas, pl. viii, fig. 1.

381 = **Cardium? sancti-sabæ**, ROEMER, Kreid. Von. Tex. 1852, 48, vi, 7. This is not a true *Papyridea*, and it is very doubtful whether it can go into the group *Liopistha*.

404 — The genus *Tancredia* differs so materially from the *Cardiidæ*, *Lucinidæ*, *Isocardiidæ*, &c., to which it has been respectively referred, that we are probably less liable to err in keeping it separate as the type of a distinct family.

405 = **Cyprina arenaria**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. May 1857, 143.

409 = **Cyprina humilis**, MEEK & HAYDEN, ib. May 1860, 179. The name *Cyprinidæ*, having been in use for a family of fishes, since 1831, cannot be retained for this family; I would, therefore, propose to call it *Veniliidæ*.

410 = **Venilia quadrata**, GABB, Proc. Acad. Nat. Sci. Nov. 1861, 364 (not *Cyprina quadrata*, D'Orbigny, 1843, which is a true *Venilia*).

412 = **Cyprina subtumida**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. May 1857, 144.

416 = **Cyprina Laphami**, SHUMARD, Proc. Bost. Soc. Nat. Hist. Sept. 1861.

417 = **Venus? circularis**, MEEK & HAYDEN, ib. Nov. 1856, 27.

425 = **Callista eufalensis**, CONRAD, Jour. Acad. sec. ser. IV, 285, xlvi, 24.

426 = **Cytherea Deweyi**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. April 1846, 83.

427 = **Cytherea leonensis**, CONRAD, Mex. Bound. Rept. I, part 2, 1858, 153, vi, 1. (Wrongly printed *lenonensis* on p. 13 of the List.)

428 = **Cytherea lamarensis**, SHUMARD, Trans. St. Louis Acad. Sci. I, p. 600.

429 = **Cytherea missouriana**, MORTON, Jour. Acad. Nat. Sci. sec. ser. VIII, 120, ii, 2.

430 = **Cytherea nebrascensis**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. April 1856, 83.

431 = **Cytherea orbiculata**, HALL & MEEK, Mem. Am. Acad. V, new ser. I, fig. 7.

432 = **Cytherea Owenana**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. VIII, 273.

433 = **Cytherea pellucida**, MEEK & HAYDEN, ib. Nov. 1856, 278.

434 = **Cytherea texana**, CONRAD, Mex. Bound. Rept. I, part 2, 1858, 153, vi, 2.

435 = **Cytherea tippana**, CONRAD, Jour. Acad. Nat. Sci. VIII, sec. ser. 326, xxxiv, 18.

436 = **Venus Meekiana**, GABB, ib. IV, 394, lxviii, 23.

437 = **Venus ripleyana**, GABB, ib. 393, lxviii, 22.

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438 = **Cytherea tenuis**, Hall & Meek, Mem. Am. Acad. Arts and Sci. V, new ser. 383, i, 5.

440 = **Tellina formosa**, Meek & Hayden, Proc. Acad. Nat. Sci. May 1860, 179.

454 = **Solen irradians**, Roemer, Kreid. Von. Tex. 1852, 54, vi, 9.

455 = **Psammobia cancellato-sculpta**, Roemer, ib. 46, vi, 10.

473 = **CYMELLA**, Meek. Type **Pholadomya undata**, Meek & Hayden, Proc. Acad. April 1856, 81.

Shell small, subequilateral, ovate, with numerous regular, well-defined concentric undulations, crossed on the middle of the valves by a few radiating impressed lines, not marked in the depressions between the ridges.

480 = **Leda fibrosa**, Evans & Shumard, Trans. St. Louis Acad. 1857, 39.

509 — Not being acquainted with the hinge and interior of this genus, I placed it with doubt in the family *Saxicavidæ*. Since the catalogue was stereotyped, I have been informed by Prof. Agassiz, that he has specimens showing it to possess the internal characters of the *Mytilidæ*.

526 = **GONIOCHASMA**, Meek. Type **Xylophaga Stimpsoni**, Meek & Hayden, Proc. Acad. Phila. May 1857, 141.

Differs from *Martesia* in having no accessory dorsal pieces, and in having the anterior hiatus formed by a rectangular notch in the antero-ventral margin of each valve.

527 = **XYLOPHAGELLA**, Meek. Type **Xylophaga elegantula**, Meek & Hayden, Proc. Acad. Phila. 1857, 141.

Has the form and ornamentation of *Xylophaga*, but internal casts show the impression of an oblique, internal postero-dorsal ridge not seen in that genus. Burrows apparently always without a shelly lining.

542 = **Ringicula pulchella**, Shumard, Proc. Boston Soc. Nat. Hist. Sept. 1861.

Since the publication of a paper on the *Actæonidæ*, in the Am. Jour. Sci. vol. XXXV, p. 84, I have, through the kindness of Dr. Stimpson, had an opportunity to examine a drawing of the animal of a recent *Ringicula* (*R. arctata*, Gould), made by him from a living specimen taken on the coast of China. From this drawing, and his notes, it appears that it has a large well-developed siphon, which lies (perhaps when the creature moves) folded back upon the body whorl between two short, unequal tentacular lobes? From this fact, and the general dissimilarity of the animal to any of the known types of the *Actæonidæ*, I can scarcely doubt the propriety of regarding this genus as the type of a distinct family, which will probably include the extinct groups *Ringinella*, *Cinulia*, *Avellana*, *Euptycha* and *Aptycha*.

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544 = **Actæonina naticoides**, Gabb, Jour. Acad. Nat. Sci. IV, sec. se 293.

545 = **Ringicula subpellucida**, Shumard, Proc. Bost. Soc. Nat. His Sept. 1861, 192.

546 = **Ringicula acutispira**, Shumard, ib. 193.

548 = **Actæonina biplicata**, Gabb, Proc. Acad. Nat. Sci. Phila. Marc 1860, 93.

572 = **Scalpellum inequicostatum**, Shumard, Proceed. Bost. Soc. Na Hist. 1861, 199.

Scalpellum, Leach, being a genus of *Crustacea*, it was perha by some oversight in copying manuscript that this species w described under that name.

577 = **Capulas occidentalis**, Hall & Meek, Mem. Am. Acad. Arts a Sci. V, new ser. 1856, 385.

583 = **Phasianella Haleana**, D'Orbigny, Prodr. de Pal. II, 1850, 224.

584 = **Phasianella perovata**, Shumard, Trans. St. Louis Acad. I, 597.

585 = **Phasianella punctata**, Gabb, Jour. Acad. Nat. Sci. Phila. IV, se ser. 299.

588 = **Architectonica Abbotti**, Gabb, Proc. Acad. Nat. Sci. Oct. 186 321.

590 = **Solarium abyssinus**, Gabb, ib. March 1860, 94.

580 — Not *Delphinula*, Lamk.

581 and 582 — *Straparollus* of Montfort does not occur in the Cretaceo or more recent rocks.

592 = **Nerita (Neretis) densata**, Conrad, Jour. Acad. new ser. IV, 28 xlvi, 57.

593 = **Natica ambigua**, Meek & Hayden, Proc. Acad. Nat. Sci. Marc 1856, 64.

594 = **Natica Tuomeyana**, Meek & Hayden, ib. Nov. 1856, 270.

615 = **SPIRONEMA**, Meek. Type **Turbo tenuilineata**, Meek Hayden, Proc. Acad. Nat. Sci. Phila. March 1856, 64.

Shell ovate; whorls rounded, and separated by a rather dee suture; aperture ovate, lip thin, continuous; columella n thickened, perforated by a very small umbilicus; surface wit revolving lines and furrows. The non-perlaceous texture of t interior layer, as well as the other characters of such Cretaceo shells, remove them from the *Trochidæ*.

616 = **Tuba? bella**, Conrad, Jour. Acad. Nat. Sci. IV, 289, xlvi, 38.

624 = **Rostellaria biangulata**, Meek & Hayden, Proc. Acad. Nat. Sc 1856, 65.

625 = **Aporrhais parva**, Meek & Hayden, ib. May 1860, 178.

626 = **Aporrhais sublævis**, Meek & Hayden, ib.

627 = **DREPANOCHEILUS**, Meek. Type **Rostellaria american** Evans & Shumard, Proc. Acad. Nat. Sci. Phila. 1860, 423.

Shell like *Aporrhais*, but without a posterior canal extendi up the spire, and having the lip produced into a single, usuall

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scythe-shaped projection. This type, as well as the including genus *Anchura*, differ from the Jurassic genus *Alaria*, in never having the labial appendage developed during the growth of the shell, so as to be left behind the aperture as projecting spines on the body whorl or spire. It, however, probably includes some of the so-called *Alaria*.

628 = **Aporrhais decemlirata**, CONRAD, Jour. Acad. Nat. Sci. Phila. sec. ser. III, 330, XXXIV, 11.

629 = **Rostellaria nebrascensis**, EVANS & SHUMARD, Proc. Acad. Aug. 1856, 164.

630 = **Rostellaria rostrata**, GABB, Jour. Acad. Nat. Sci. IV, 390, lxviii, 7.

643 = **ISOPLEURA**, MEEK. Type **Rimella curvilirata**, CONRAD, Jour. Acad. Nat. Sci. III, new series, 1858, 331.

I cannot think this and the succeeding species congeneric with *Rimella rimosa*, Sowerby, the type of Prof. Agassiz's genus *Rimella*.

644 = **Chemnitzia Meekiana**, GABB, Jour. Acad. Nat Sci. IV, 1860, 299.

646 = **PTEROCERELLA**, MEEK. Type **Harpago tippana**, Jour. Acad. Nat. Sci. III, sec. ser. 331, XXXV, 25.

Shell small, thin; whorls few, rounded, smooth or subangulated; last one not much enlarged. Lip greatly extended, and ascending the spire, trilobate—the middle lobe much larger and more produced than the others, carinated on the outer side.

I cannot believe such shells as this should be placed in the same genus with *Strombus chiragra* and *S. lambis*, Linnæus, the types of *Harpago* and *Pterocera*; nor is it probable that *any* of our Cretaceous or older species, usually referred to *Pterocera*, really belong to that genus as properly restricted. This type should probably be placed in the *Aporrhaidæ*, on p. 19 of the List, instead of in the *Strombidæ*.

651 = **CHEMNITZIA**, CONRAD, 1860 (not D'ORBIGNY, 1839). Mr. Conrad proposes to retain this name for a group of Cretaceous shells which he ranges as a subgenus under *Turbonilla*, Risso. He does not say which species he regards as the type of the group, though his description was evidently written from his *C. laqueata* and *C. melanopsis*; consequently I have regarded these as typical, and the others as doubtful forms.

658 = **Scalaria texana**, ROEMER, Kreid. Von. Tex. 1852, IV, fig. 11, *a*, *b*.

662 = **Scalaria Forshayli**, SHUMARD, Proc. Bost. Soc. Nat. Hist. Sept. 1861, 195.

668 = **Natica acutispira**, SHUMARD, Trans. St. Louis Acad. I, 597.

689 = **Volutilithes bella**, GABB, Jour. Acad. Nat. Sci. IV, sec. ser. 300, xlviii, 7.

690 = **Volutilithes biplicata**, GABB, ib. 6.

691 = **Volutilithes Conradi**, GABB, ib. 10.

692 = **Volutilithes nasuta**, GABB, ib. 9.

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713 = **TRACHYTRITON**, MEEK. Type **Fusus? vinculum**, HALL & MEEK, Mem. Am. Acad. Arts and Sci. V, new ser. 39, iii, 5, *a*, *b*.

Shell subfusiform or buccíniform, rather thin; canal moderate, nearly straight; columella smooth; outer lip sharp excepting at intervals, when it becomes thickened and crenate within. Surface without distinct varices, roughened or cancellated by small, regular, revolving bands, crossing small, equidistant longitudinal costæ.

Seems to be nearly related to the recent *Triton cancellatum*, Lamk., and *T. oregonensis*, Redfield, usually referred to *Argobuccinum* or *Lagena*, Klein; though they appear sufficiently distinct from Klein's types, even if his genera could be regarded as regularly established.

721 = **Pleurotomaria texana**, SHUMARD, Proc. Bost. Soc. Nat. Hist. Sept. 1861, 197.

723 = **PIBSTOCHILUS**, MEEK. Type **Fusus Scarboroughi**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. Phila. May 1857, p. 139.

Differs from the typical species of *Clavellithes* in having the aperture acutely angular behind (in consequence of the outer lip being closely appressed to the body whorl above), instead of forming a kind of posterior canal; and in having the inner lip thin instead of thickened above.

Includes the Eocene *Clavella vicksburgensis*, Conrad, Jour. Acad. Nat. Sci. sec. ser. II, pl. i, fig. 5. As Swainson neither figured, described, nor referred to any known species in publishing his name *Clavella*, it cannot be retained.

724 = **Fusus Vaughani**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. May 1857, 139.

This is not a true *Cantharis*, as has been determined since the List was in type. It may remain under that name, however, until its affinities can be determined from the examination of better specimens.

726 = **Fusus? flexicostatus**, MEEK & HAYDEN, ib. 1856, 66.

727 = **Fusus? Halesmus**, D'ORBIGNY, Prodrome de Pal. II, 1850, 228.

728 = **Neptunea impressa**, GABB, Jour. Acad. IV, new ser. 389, lxviii, 5.

729 = **Fusus intertextus**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. Phila. May 1857, 139.

730 = **Fusus Newberryi**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. May 1857, 66.

I have long suspected that this shell, and others from the Upper Missouri, are not generically distinct from *Pyrifusus;* but was left in doubt because that genus was described as having a broad, thick, flattened columella. On sending a specimen of this species to Mr. Conrad for comparison, he writes that he now thinks the columella of his typical specimen was flattened by pressure, and that our shell probably belongs to the same

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genus. I have, therefore, referred this and several other species to *Pyrifusus*. Should it be found, however, when better specimens can be examined, that the type of that genus really has a broad, flattened columella, and consequently that our shells belong to a distinct genus, I would propose for this group the name *Neptunella*, with *Fusus Newberryi*, Meek & Hayden, as its type. It would also include *F. intertextus* and *F. subturritus*, M. & H.; *Afer bellalirata*, Conrad; and *F. mullicaensis*, Gabb. These forms cannot be referred to *Afer*, Conrad, because that group was founded upon the recent *Fusus afer*, of Lamarck, a very distinct type.

It is not probable that *any* of the species retained under the name *Fusus*, in the foregoing List, belong to that genus as properly restricted. It is, however, probably better to leave them there, until Conchologists have agreed in regard to what particular type of that heterogeneous group the name *Fusus* is to be applied.

732 = **Fusus subturritus**, Meek & Hayden, ib.

734 = **Fusus? tenuilineatus**, Hall & Meek, Mem. Am. Acad. Arts and Sci. V, new ser. 394, iii, 9.

740 = **Pleurotomaria mullicaensis**, Gabb, Proc. Acad. Nat. Sci. March 1860, p. 95. Should be *Pyrifusus milicaensis*, (Gabb) Meek.

748 = **Pyrula Bairdi**, Meek & Hayden, Proc. Acad. Nat. Sci. March 1856, 66.

751 = **Fusus? dakotensis**, Meek & Hayden, ib. 65.

770 = **Hamites Leai**, Troost, Fifth Rept. Geol. Surv. Tennessee, 1840, 53.

773 = **Hamites Verneuilii**, Troost, ib. 52.

858 = **Turrilites** (sp. ined.), Owen, Second Report Geol. Recon. Arkansas, pl. viii, 2.

859 = **Helicoceras tortum**, Meek & Hayden, Proc. Acad. Nat. Sci. Phila. March 1858, 54.

860 = **Helicoceras? angulatum**, Meek & Hayden, ib. May 186 , 176.

861 = **Turrilites cheyennensis**, Meek & Hayden, ib. Nov. 1856, 280.

874 = **Nautilus orbiculatus**, Tuomey, ib. 1855, 167.

This should probably be written *Aganides orbiculatus*, since Montfort's name *Aganides* (1808) was founded apparently upon a species of this group.

876 = **Belemnites paxillosa**, Lamk. 1801, Syst. 104.

883 = **Vermetus rotula**, Morton, Synop. Org. Rem. 1834, 81, i, 14.

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NOTES AND EXPLANATIONS.

(JURASSIC.)

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891 = **CAMPTONECTES**, Agassiz MSS. Example **Pecten len** Sowerby. Also includes *Pecten bellistriatus*, Meek, Proc. Aca Nat. Sci. July, 1860, 311.

The name *Camptonectes* has been adopted by Prof. Agass for a group of Jurassic and Cretaceous species, several of whi have been confounded under the name *Pecten lens*. The shells are subequivalve, compressed, lenticular, and closed a around. They have generally small compressed ears, and short edentulous hinge; byssal sinus under the anterior ear right valve deep, well defined. Surface ornamented with fi very regular, closely arranged, often sub-punctate, radiating sub-divaricate striæ, which curve gracefully outwards on ea side.

This genus is known to be represented by at least one unc scribed species in the Cretaceous beds of New Jersey. It w include a few species, such as *Pecten cottaldinus*, D'Orbigi upon which the radiating striæ are nearly or quite obsolete.

892 = **Pecten extenuatus**, Meek & Hayden, Proc. Acad. Nat. Sci. M 1860, 184.

895 = **Avicula? curta**, Hall, Stansbury's Rept. Exped. to Great S Lake, 1852, 412. See Am. Jour. Sci. March, 1864, 212.

896 = **OXYTOMA**, Meek. Type **Avicula Munsteri**, Bronn, L Zeitsch. 1829, 76.

The shells of this group differ from the living typical *Pte* (= *Avicula*), in having a much more deeply and sharply fined byssal sinus. They are also less oblique, more distinc inequivalve, and usually more strongly costate, particularly the left valve, around the pallial margins of which the cos sometimes terminate in projecting spines. This type forms transition from the true *Pteria* to *Eumicrotis*.

Includes *Avicula costata*, Morris & Lycett; *A. digitata*, a apparently *Monotis interlævigata*, Quenstedt, and *A. cygnip* Phillips. Mainly, if not entirely, confined to the Jurassic roc

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897 = **Modiola pertenuis**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. March 1858, 51.

898 = **Modiola (Perna) formosa**, MEEK & HAYDEN, ib. Dec. 1861, 439. The names of these two shells should be written *Perna pertenuis*, and *P. formosa*, if Scopoli's name *Volsella* is not adopted.

907 = **Venus unionides**, ROEMER, Ool. I, 109, tab. 8, fig. 6. This and the two preceding species (904 and 905) belong to the genus *Pleuromya*, which name must be adopted if *Myacites*, Schlot., as affirmed by Bronn and Goldf., is not to be retained.

910 — This, and 911, 912, and 913, are only placed provisionally in the Jurassic list.

912 — Should be written *Neritina nebrascensis*, if Humphrey's name *Neritella* is not to be adopted.

914 = **LIOPLACODES**, MEEK. Type **Melania (Potadoma) veterna**, MEEK & HAYDEN, Proc. Acad. Nat. Sci. Phila. Dec. 1861, 444.

Differs from the type of *Lioplax*, Troschel, in its more elongated form, smaller body whorl, more constricted suture, and particularly in having the posterior extremity of the aperture angular instead of rounded, owing to the oblique flattening of the upper side of the body whorl.

From the types usually included in *Melania*, it differs in having the columella perforated by a small umbilical opening, and the peritreme continuous.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

156

CATALOGUE

OF

MINERALS,

WITH THEIR FORMULAS, ETC.

PREPARED FOR THE SMITHSONIAN INSTITUTION.

BY

T. EGLESTON.

WASHINGTON:
SMITHSONIAN INSTITUTION:
JUNE, 1863.

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ADVERTISEMENT.

THE following Catalogue of Mineral Species has been prepared by Mr. Egleston, at the request of the Institution, for the purpose of facilitating the arranging and labelling of collections, and the conducting of exchanges, as well as of presenting in a compact form an outline of the science of mineralogy as it exists at the present day.

In labelling collections it is considered important to give the chemical composition as well as the names, and hence the formulæ have been added.

Some doubt was at first entertained as to the system of classification which ought to be adopted; but after due consideration it was concluded to make use of that followed by Professor Dana, in the last edition of his Manual of Mineralogy. Whatever difference of opinion may exist as to the best classification, the one here employed is that which will be most generally adopted in this country, on account of the almost exclusive use of Professor Dana's excellent Manual.

The Institution is under obligations to Prof. Dana, Prof. Brush, Dr. Genth, and other gentlemen, for their assistance in perfecting the work, and carrying it through the press.

Copies of the Catalogue, printed on one side only, to be cut apart for labels, can be furnished on application.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION,
June, 1863.

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INTRODUCTION.

To render the present Catalogue of Minerals more than a mere enumeration of names, the formulæ expressing the chemical composition of the mineral and the system in which it crystallizes, as far as at present understood, have been given. The classification adopted is Dana's, as published in the fourth edition of his Mineralogy. Some species that have proved not to be well founded have been omitted, and many since published have been added. Of these latter species, some must be considered as having only a provisional place in the series, and it is probable that others will ultimately be dropped altogether. In making the additions and corrections, the Supplements to Dana's Mineralogy, which have appeared from time to time in *Silliman's Journal*, have always been consulted, and the most probable formulæ, as deduced by recent investigations, have been selected. In a few instances a change has been made in the place of a species where a more thorough examination has thrown light upon the true nature of the mineral or where it has been found that the system of crystallization had previously been incorrectly given. *Faujasite*, p. 19, was formerly considered as *dimetric*, it has lately been proved to be *monometric*, and it has therefore been placed among the monometric zeolites. The formula for *Euclase* is the one given by Rose; Damour's analysis gave water, and the formula $2\dot{B}e\ \ddot{S}i^{\frac{1}{2}} + 3\dot{A}l\ \ddot{S}i^{\frac{1}{2}} + \dot{H}$. Rammelsberg has recently discovered the existence of protoxides in *Staurotide*, and proposes as a general formula $(\dot{R}, \dot{R}^2) + \ddot{S}i^3$. In the formula for *Opal*, water has not been written,

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as it is found in very variable quantities, and is not considered as essential. For what is known of the species added to the list of organic compounds, see the 2d, 5th, 6th, and 7th Supplements to Dana's Mineralogy. For changes in the systems of crystallization, Des-Cloizeaux has generally been the authority.

A table of the symbols used, with illustrations of the meaning of the formulæ, are given on p. vii., and on p. ix. will be found a table relating to the systems of crystallization. In the first column are the simple forms from which all the others, of the same system, are derived; in the second the description of the axes of these simple forms, and in the others the nomenclature that has been adopted by the authors whose names stand at the head of the column. The axes of a crystal are imaginary lines drawn through its centre and about which it is symmetrical. It has been found most convenient to refer to the systems of crystallization by the numbers which have been placed on the left hand of the table.

An asterisk following the name of a mineral, as *Gold*,* p. 1, denotes that it has been found in the United States. A dagger, as *Danburite*,† p. 14, denotes that it has been found in the United States only. The other minerals have not, so far as is known, been found in this country.

T. EGLESTON.

New York, May, 1863.

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CHEMICAL SYMBOLS.

Ag. (Argentum)	Silver.	Mg.	Magnesium.
Al.	Aluminium.	Mn.	Manganese.
Aq.	Water.	Mo.	Molybdenum.
As.	Arsenic.	N.	Nitrogen.
Au. (Aurum)	Gold.	Na. (Natrum)	Sodium.
B.	Boron.	Ni.	Nickel.
Ba.	Barium.	O.	Oxygen.
Be. (Beryllium)	Glucinum.	Os.	Osmium.
Bi.	Bismuth.	P.	Phosphorus.
Br.	Bromine.	Pb. (Plumbum)	Lead.
C.	Carbon.	Pd.	Palladium.
Ca.	Calcium.	Pt.	Platinum.
Cb.	Columbium.	Rd.	Rhodium.
Cd.	Cadmium.	Ru.	Ruthenium.
Ce.	Cerium.	S.	Sulphur.
Cl.	Chlorine.	Sb. (Stibium)	Antimony.
Co.	Cobalt.	Se.	Selenium.
Cr.	Chromium.	Si.	Silicium.
Cu. (Cuprum)	Copper.	Sn. (Stannum)	Tin.
D.	Didymium.	Sr.	Strontium.
F.	Fluorine.	Ta.	Tantalum.
Fe. (Ferrum)	Iron.	Tb.	Terbium.
H.	Hydrogen.	Te.	Tellurium.
Hg. (Hydrargyrum)	Mercury.	Th.	Thorium.
I.	Iodine.	U.	Uranium.
Ir.	Iridium.	V.	Vanadium.
K. (Kalium)	Potassium.	W. (Wolframium)	Tungsten.
La.	Lanthanum.	Y.	Yttrium.
Li.	Lithium.	Zn.	Zinc.
M.	Mellic Acid.	Zr.	Zirconium.

NOTE.—R is an indefinite symbol, and may refer to any one or more of the symbols in the table. In the formulæ given in the Catalogue the dots over the symbols indicate atoms of oxygen—thus, Fe indicates one atom

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of Iron combined with one of Oxygen. A dashed letter indicates a double atom of the substance—thus, $\ddot{F}e$ means two atoms of Iron combined with three of Oxygen. A general formula has sometimes been given when one or more of the elements are replaced by others in variable proportions, or for species which include several important varieties, as Melinophane, p. 12, Allanite and others, p. 14, Pyroxene, p. 11, Amphibole and Peridot, p. 12, &c. In these formulæ $\dot{R}$ represents all the bases composed of one atom of an element and one of Oxygen, and $\ddot{R}$ all those composed of two atoms of an element and three of Oxygen. Thus the general formula for the family of the Chlorites, p. 17, is $5\dot{R}^3\,\breve{S}i^{\frac{3}{4}} + 3\ddot{R}\,\breve{S}i^{\frac{3}{4}} + 12\dot{H}$, which means that the mineral contains five atoms of a compound made up of three atoms of proto-base combined with three-quarters of an atom of silicic acid, plus three atoms of a compound of one atom of sesqui-base combined with three-quarters of an atom of silicic acid, plus 12 atoms of water. In Chlorite and Pennine the proto-bases are Magnesia and Iron, but in Clinochlore Magnesia only; in Chlorite and Clinochlore the sesqui-base is Alumina only, while in Pennine it is Alumina and Iron. It will thus be seen that a large figure written as a co-efficient refers to the whole of the member to which it is prefixed, while a small figure written as an exponent refers only to the symbol to which it is attached. Thus $5\dot{R}^3\,\breve{S}i^{\frac{3}{4}}$ means five atoms of $\dot{R}^3\,\breve{S}i^{\frac{3}{4}}$, while $\dot{R}^1$ means simply three atoms of $\dot{R}$. When the symbols are written together the substances are in chemical combination—thus As S which is the formula for Realgar, p. 2, characterizes that mineral as a sulphuret of Arsenic. When one element is combined with several these are placed in brackets and each symbol is followed by a comma—thus Smaltine (Co, Fe, Ni) As^2, p. 4, is an Arseniuret of Cobalt, Iron, and Nickel. In this case the proportions of Cobalt, Iron, and Nickel are not stated. In the formula of Eisennickelkies $(\frac{1}{3}Ni + \frac{2}{3}Fe)$ S, p. 3, a sulphuret of Nickel and Iron, the proportions are stated. The general formula in this case would be RS; one-third of R is Nickel, and the other two-thirds Iron. When more than one element is combined with several others, both members are written in brackets; thus Glaucodot (Co, Fe) $(S, As)^2$, p. 4, is a Bi-sulpho-arseniuret of Cobalt and Iron. In some instances, as Bismuth Silver, p. 1, no formula has been given, but simply an enumeration of the elements of which the mineral is composed; in this case each symbol is followed by a comma.

When the water of a mineral has not been determined, it has been written Aq. instead of $\dot{H}$.

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SYSTEMS OF CRYSTALLIZATION.

No.	Simple Forms.	Axes.
1	Cube and octahedron.	3 axes rectangular and equal.
2	Right prism with square base.	3 axes rectangular, 2 equal.
3	Right prism with rectangular or rhombic base.	3 axes rectangular and unequal.
4	Right rhomboidal and oblique rhombic prisms.	3 axes unequal, 2 rectangular.
5	Oblique disymetric rhomboidal prism.	3 axes unequal, and unequally inclined.
6	Rhombohedron and hexagonal prism.	4 axes, 3 equal and equally inclined, 1 at right angles to the other three.

NAMES USED BY DIFFERENT AUTHORS.

No.	Naumann.	Mohs.	Weiss & Rose.	Phillips.	Delafosse.	Dana.
1	Tesseral.	Tessular.	Regular.	Cubic.	Cubic.	Monometric.
2	Tetragonal.	Pyramidal.	2 and 1 axial.	Pyramidal.	Tetragonal.	Dimetric.
3	Rhombic.	Orthotype.	1 and 1 axial.	Prismatic.	Orthorhombic.	Trimetric.
4	Monoclinohedric.	Hemiorthotype.	2 and 1 membered.	Oblique.	Clinorhombic.	Monoclinic.
5	Triclinohedric.	Anorthotype.	1 and 1 membered.	Anorthic.	Clinohedric.	Triclinic.
6	Hexagonal.	Rhombohedral.	3 and 1 axial.	Rhombohedral.	Hexagonal.	Hexagonal.

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CATALOGUE OF MINERALS.

No.	Name.	Formula.	System of crystallization.
	A. NATIVE ELEMENTS.		
	1. *Hydrogen Group.*		
1.	**Gold** *	Au	1
2.	**Platinum** *	Pt	1
3.	**Platiniridium** *	Ir, Pt	1
4.	**Palladium**	Pa	1
5.	**Quicksilver** *	Hg	1
6.	**Amalgam**	$Ag\,Hg^2$ and $Ag\,Hg^3$	1
7.	**Arquerite**	$Ag^6\,Hg$	1
8.	**Gold Amalgam** *	$(Au, Ag)^8\,Hg^6$	
9.	**Silver** *	Ag	1
10.	**Bismuth Silver**	Fe, Bi, Pb, Ag	1?
11.	**Copper** *	Cu	1
12.	**Lead**	Pb	1
13.	**Iron** *	Fe	1
14.	**Tin**	Sn	2
15.	**Zinc**	Zn	6
	2. *Arsenic Group.*		
16.	**Iridosmine** *	Ir, Os, Rd	6
17.	**Tellurium**	Te	6

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No.	Name.	Formula.	System of crystallization.
18.	**Bismuth** *	Bi	6
19.	**Tetradymite** *	Bi, Te	6
20.	**Antimony**	Sb	6
21.	**Arsenic** *	As	6
22.	**Arsenical Antimony** *	Sb, As	6
23.	**Sulphur** *	S	3
24.	**Selenium**	Se	4
25.	**Selensulphur**	Se, S	
		3. *Carbon Group.*	
26.	**Diamond.** *	C	1
27.	**Mineral Coal**	C	
	27a. Anthracite *		
	27b. Bituminous Coal *		
	27c. Jet *		
	27d. Lignite *		
28.	**Graphite** *	C	6

B. SULPHURETS, ARSENIURETS, ETC.

I. BINARY COMPOUNDS.

1. Compounds of Elements of the Arsenic Group with one another.

29.	**Realgar**	As S	4
30.	**Orpiment** *	$As^2 S^3$	3
31.	**Dimorphine**	$As^4 S^3$	3
32.	**Bismuthine** *	$Bi^2 S^3$	3
33.	**Stibnite** *	$Sb^2 S^3$	3

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No.	Name.	Formula.	System of crystallization.
	2. Compounds of Elements of the Arsenic Group with those of the Hydrogen Group.		
	1. Discrasite Division.		
34.	Discrasite	$Ag^3 Sb$	3
35.	Domeykite *	$Cu^3 As^2$	
36.	Algodonite *	$Cu^6 As^2$	
37.	Whitneyite *	$Cu^9 As^2$	
	2. Galena Division.		
38.	Silver Glance *	Ag S	1
39.	Erubescite *	(Fe, Cu) S	1
40.	Galena *	Pb S	1
41.	Steinmannite	Pb, S, Sb	1
42.	Cuproplumbite ?	2Pb S + Cu S	1
43.	Alisonite	3Cu S + Pb S	
44.	Manganblende	Mn S	1
45.	Syepoorite	Co S	
46.	Eisennickelkies	$(\frac{1}{3}Ni + \frac{2}{3}Fe)$ S	1
47.	Clausthalite	Pb Se	1
48.	Naumannite	Ag Se	1
49.	Berzelianite	Cu Se	
50.	Eucairite	(Cu, Ag) Se	
51.	Hessite *	Ag Te	1?
52.	Altaite	Pb Te	1
53.	Grünauite	$(Bi, Ni, Co, Fe)^2 S^3$	1
54.	Blende *	Zn S	1
55.	Copper Glance *	Cu S	3

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No.	Name.	Formula.	System of crystallization.
56.	**Akanthite**	$Ag\,S$	3
57.	**Stromeyerite**	$(Cu, Ag)\,S$	3
58.	**Cinnabar** *	$Hg\,S$	6
59.	**Millerite** *	$Ni\,S$	6
60.	**Pyrrhotine** *	$Fe^7\,S^8$	6
61.	**Greenockite**	$Cd\,S$	6
62.	**Wurtzite**	$Zn\,S$	6
63.	**Onofrite**	$Hg^6\,Se^5$	
64.	**Copper Nickel** *	$Ni\,As$	6
65.	**Breithauptite** *	$Ni\,Sb$	6
66.	**Kaneite**	$Mn\,As$	
67.	**Schreibersite**	Fe, P, Ni	
		3. *Pyrites Division.*	
68.	**Pyrites** *	$Fe\,S^2$	1
69.	**Hauerite**	$Mn\,S^2$	1
70.	**Smaltine** *	$(Co, Fe, Ni)\,As^2$	1
71.	**Cobaltine**	$Co\,(S, As)^2$	1
72.	**Gersdorffite** *	$Ni\,(S, As)^2$	1
73.	**Ullmannite**	$Ni\,(S, As, Sb)^2$	1
74.	**Marcasite** *	$Fe\,S^2$	3
75.	**Rammelsbergite**	$Ni\,As^2$	3
76.	**Leucopyrite** *	$Fe\,As^2$	3
77.	**Mispickel** *	$Fe\,(As, S)^2$	3
78.	**Glaucodot**	$(Co, Fe)\,(S, As)^2$	3
79.	**Sylvanite** *	$(Ag, Au)\,Te^2$	3
80.	**Nagyagite**	$(Pb, Au)\,(Te, S)^2$	2

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No.	Name.	Formula.	System crystalliz:
81.	**Covelline**	$Cu\,S^2$	
82.	**Molybdenite** *	$Mo\,S^2$	
83.	**Riolite**	$Ag\,Se^2$	

4. Skutterudite Division.

84.	**Skutterudite**	$Co\,As^3$	

II. DOUBLE BINARY COMPOUNDS.

1. The Persulphuret a Sulphuret of an Element of Hydrogen Group, as of Iron, Cobalt, or Nickel.

85.	**Linnæite** *	$Co\,S + Co^2\,S^3$	
86.	**Cuban**	$Cu\,S + Fe^2\,S^3$	
87.	**Chalcopyrite** *	$Cu\,S + Fe^2\,S^3$	
88.	**Barnhardite** *	$2Cu\,S + Fe^2\,S^3$	
89.	**Tin Pyrites**	$Cu\,S\,(Sn^2\,S^3, Fe^2\,S^3)$	
90.	**Sternbergite**	$Ag\,S + 2Fe^2\,S^3$?	

2. The Persulphuret a Sulphuret of Elements of t Arsenic Group.

91.	**Wolfsbergite**	$Cu\,S + Sb^2\,S^3$	
92.	**Tannenite**	$Cu\,S + Bi^2\,S^3$	
93.	**Berthierite**	$Fe\,S + Sb^2\,S^3$	
94.	**Zinkenite**	$Pb\,S + Sb^2\,S^3$	
95.	**Miargyrite**	$Ag\,S + Sb^2\,S^3$	
96.	**Plagionite**	$Pb\,S + \frac{4}{3}Sb^2\,S^3$	
97.	**Jamesonite**	$Pb\,S + \frac{2}{3}Sb^2\,S^3$	
98.	**Heteromorphite**	$Pb\,S + \frac{1}{2}Sb^2\,S^3$	
99.	**Brongniardite**	$(Pb, Ag)\,S + \frac{1}{2}Sb^2\,S^3$	
100.	**Chiviatite**	$(Cu, Pb)\,S + \frac{1}{2}Bi^2\,S^3$	

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No.	Name.	Formula.	System of crystallization.
101.	Dufrenoysite	$PbS + \frac{1}{2}As^2S^3$	1
102.	Pyrargyrite	$AgS + \frac{1}{3}Sb^2S^3$	6
103.	Proustite *	$AgS + \frac{1}{3}As^2S^3$	6
104.	Freieslebenite *	$(Ag, Pb)S + \frac{1}{3}Sb^2S^3$	4
105.	Bournonite	$(Cu, Pb)S + \frac{1}{3}Sb^2S^3$	3
106.	Kenngottite	Ag, Pb, S, Sb	4
107.	Boulangerite	$PbS + \frac{1}{3}Sb^2S^3$	
108.	Aikinite	$(Cu, Pb)S + \frac{1}{3}Bi^2S^3$	3
109.	Wölchite	Pb, Cu, As, Sb, S	3
110.	Clayite?	(Cu, Pb) (S, As, Sb)	1
111.	Kobellite?	$(Fe, Pb)S + \frac{2}{3}(Sb, Bi)^2S^3$	1?
112.	Meneghinite	$PbS + \frac{1}{4}SbS^3$	
113.	Tetrahedrite *	$(Cu, Fe, Zn, Ag)S + \frac{1}{4}(Sb, As)^2S^3$	1
114.	Tennantite *	$(Cu, Fe)S + \frac{1}{4}As^2S^3$	1
115.	Geocronite *	$PbS + \frac{1}{6}(Sb, As)^2S^3$	3
116.	Polybasite	$(Ag, Cu)S + \frac{1}{6}(Sb, As)^2S^3$	6
117.	Stephanite	$AgS + \frac{1}{6}Sb^2S^3$	3
118.	Enargite *	$(Cu, Fe, Zn)S + \frac{1}{3}(As, Sb)^2S^5$?	3
119.	Xanthocone	$(3AgS + As^2S^5) + 2(3AgS + As^2S^5)$	6
120.	Fireblende	Ag, S, Sb	4
121.	Wittichite	Cu, Bi, S	3

C. FLUORIDS, CHLORIDS, BROMIDS, IODIDS.

1. *Calomel Division.*

122.	Calomel	Hg^2Cl	2

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No.	Name.	Formula.	System of crystallization.
		2. Rock Salt Division.	
123.	Sylvine	K Cl	1
124.	Salt *	Na Cl	1
125.	Sal Ammoniac	NH^4Cl	1
126.	Kerargyrite *	Ag Cl	1
127.	Embolite	3Ag Cl + 2Ag Br	1
128.	Bromyrite	Ag Br	1
129.	Iodo-bromid of Silver	Ag, I, Br	
130.	Fluor *	Ca F	1
131.	Yttrocerite *	Ca F, YF, Ce F	
132.	Iodyrite	Ag I	6
133.	Coccinite	Hg I	2?
134.	Fluocerite	$\dot{C}e$, $\dot{Y}$, HF	6
135.	Fluocerine	$Ce^3F^6 + 3\,\dot{C}e\dot{H}$	1?
136.	Cotunnite	Pb Cl	3
137.	Muriatic Acid	H Cl	
138.	Cryolite	$Na\,F + \frac{1}{3}Al^2F^6$	2
139.	Chiolite	$Na\,F + \frac{2}{3}Al^2F^6$	2
140.	Fluellite	Al, $\dot{F}$	3
141.	Carnallite	K Cl + Mg Cl + 12$\dot{H}$	
142.	Tachhydrite	Ca Cl + 2Mg Cl + 12$\dot{H}$	

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No.	Name.	Formula.	System of crystallization.

D. OXYGEN COMPOUNDS.

I. BINARY COMPOUNDS.

1. Oxides of the Elements of the Hydrogen Group.

A. Anhydrous Oxides.

1. *Monometric.*

143.	Periclase	Ṁg	1
144.	Red Copper *	Ċu	1
145.	Martite *	Ḟe	1
146.	Iserine	Ḟe (Ḟe, Ṫi)	1
147.	Irite ?	(Ir, Ȯs, Ḟe) (Ir, Os, Cr)^2 O^3 ?	1
148.	Spinel *	* Ṁg Ä̇l	
149.	Magnetite *	Ḟe Ḟe	1
150.	Magnoferrite	† Ṁg^3 Ḟe^4	1
151.	Franklinite *	(Ḟe, Żn)^2 (Ḟe, M̈n)	1
152.	Chromic Iron *	(Ḟe, Ṁg) (Ä̇l, C̈r)	1
153.	Pitchblende	U Ü ?	1
154.	Melaconite *	Ċu	1?
155.	Plumbic Ochre *	Ṗb	

2. *Hexagonal.*

156.	Water *	Ḣ	6
157.	Zincite *	Żn	6
158.	Corundum *	Ä̇l	6
159.	Hematite *	Ḟe	6
160.	Ilmenite *	Ṫi, Ḟe,	6
161.	Plattnerite	Ṗb	6?
162.	Tenorite	Ċu	6?

* Ṁg may be replaced by Ċa, Ḟe, M̈n, or Żn, alone or in combination.

† Rammelsberg gives the formula Ṁg^m Ḟe^n, and gives 3 and 4 as the probable values of m and n.

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No.	Name.	Formula.	Syste crystalli
		3. *Dimetric.*	
163.	**Braunite** *	$\dot{M}n\,\dot{M}n$	
164.	**Hausmannite** *	$\dot{M}n\,\dot{M}n$	
165.	**Cassiterite** *	$\dot{S}n$	
166.	**Rutile** *	$\dot{T}i$	
167.	**Anatase** *	$\dot{T}i$	
		4. *Trimetric.*	
168.	**Chalcotrichite** *	$\dot{C}u$	
169.	**Chrysoberyl** *	$\ddot{B}e + \ddot{A}l^3$	
170.	**Brookite** *	$\dot{T}i$	
171.	**Pyrolusite** *	$\dot{M}n$	
172.	**Polianite**	$\dot{M}n\,\dot{M}n$	
		Appendix to Anhydrous Oxides.	
173.	**Minium** *	$\dot{P}b^2\dot{P}b$	
174.	**Crednerite**	$\dot{C}u^3\dot{M}n^2$	
175.	**Heteroclin** ?	$\dot{M}n, \ddot{S}i$	
176.	**Palladinite** ? *	$\dot{P}a$	
		5. *Combinations of Oxides and Chlorides or Sulphurets.*	
177.	**Voltzite**	$4ZnS + \dot{Z}n$	
178.	**Matlockite**	$PbCl + \dot{P}b$	
179.	**Mendipite**	$PbCl + 2\dot{P}b$	
180.	**Percylite** ?	$(PbCl + \dot{P}b) + (CuCl + \dot{C}u) + A$	
181.	**Karelinite** ?	$\ddot{B}i + BiS$	
		B. Hydrous Oxides.	
182.	**Diaspore** *	$\ddot{A}l\dot{H}$	
183.	**Göthite** *	$\ddot{F}e\dot{H}$	

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No.	Name.	Formula.	System of crystallization.
184.	**Manganite**	$\dot{M}n\dot{H}$	3
185.	**Limonite** *	$\dot{F}e^2\dot{H}^3$	
186.	**Brucite** *	$\dot{M}g\dot{H}$	6
187.	**Gibbsite** *	$\dot{A}l\dot{H}^3$	6
	Appendix to Hydrous Oxides.		
188.	**Völknerite** *	$\dot{M}g^6\dot{A}l + 16\dot{H}$	6
189.	**Hydrotalcite**	$\dot{M}g^5\dot{A}l + 12\dot{H}$	
190.	**Psilomelane** *	$(\dot{M}n, \dot{B}a)\dot{M}n^2 + \dot{H}$	
191.	**Newkirkite**	$\dot{M}n, \dot{F}e, \dot{H}$	
192.	**Wad** *	$*\dot{R}\dot{M}n + \dot{H}$	
193.	**Atacamite**	$CuCl + 3\dot{C}u\dot{H}$	3

2. Oxides of Elements of the Arsenic Group.

1. *Arsenic Division.*

194.	**Arsenolite** *	$\dot{A}s$	1
195.	**Senarmontite**	$\dot{S}b$	1
196.	**Valentinite**	$\dot{S}b$	3
197.	**Bismuth Ochre** *	$\dot{B}i$	
198.	**Kermesite**	$2Sb\dot{S}^2 + \dot{S}b$	4
199.	**Retzbanyite**	$(3BiS + 2CuS, PbS) + 2\dot{P}b\dot{S}$	
200.	**Cervantite**	$\dot{S}b + \dot{S}b$	
201.	**Volgerite**	$\dot{S}b + 5\dot{H}$	
202.	**Ammiolite**	$\dot{H}g, \dot{S}b, \dot{F}e, \dot{H}$	

2. *Sulphur Division.*

203.	**Sulphurous Acid** *	$\dot{S}$	
204.	**Telluric Ochre**	Te?	

* $\dot{R}$ = $\dot{K}$, $\dot{B}a$, $\dot{C}o$, $\dot{M}n$.

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No.	Name.	Formula.	System of crystallization.
205.	**Sulphuric Acid** *	$\dot{S}\dot{H}$	
206.	**Wolframine** *	$\dot{W}$	1
207.	**Molybdine** *	$\dot{M}o$	3

3. Oxygen Compounds of Carbon, Boron and Silicon.

208.	**Carbonic Acid** *	$\dot{C}$	
209.	**Sassolin**	$\dot{B}\dot{H}^3$	5
210.	**Quartz** *	$\dot{S}i$	6
	210a. Jasper *		
	210b. Agate *		
	210c. Chalcedony *		
211.	**Opal** *	$\dot{S}i$	
	211a. Precious opal		
	211b. Semi-opal *		
	211c. Hyalite *		
	211d. Geyserite		

II. OXYGEN DOUBLE BINARY COMPOUNDS.

1. Silicates.

A. Anhydrous Silicates.

1. *Edelforsite Section.*

212.	**Edelforsite**	$\dot{C}a\dot{S}i$

2. *Augite Section.*

213.	**Wollastonite** *	$\dot{C}a^3\dot{S}i^2$	4
214.	**Pyroxene**	$\dot{R}^3\dot{S}i^2$	4
	214a. Diopside *	$(\dot{C}a, \dot{M}g)^3\dot{S}i^2$	
	214b. Hedenbergite *	$(\dot{C}a, \dot{F}e)^3\dot{S}i^2$	
	214c. Augite *	$(\dot{C}a, \dot{M}g, \dot{F}e)^3\dot{S}i^2$	
215.	**Pelicanite**	$\dot{A}l\dot{S}i^3 + 2\dot{H}$	

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No.	Name.	Formula.	System of crystallization.
216.	**Spodumene** *	$(\dot{L}i, \dot{N}a)^3 \ddot{S}i^2 + 4\ddot{A}l\,\ddot{S}i^2$	4
217.	**Prehnitoid**	$(\dot{N}a, \dot{C}a)^3 \ddot{S}i^2 + 2\ddot{A}l\,\ddot{S}i^2$	
218.	**Amphibole**	$\dot{R}^4 \ddot{S}i^3$	4
	218a. Tremolite *	$(\dot{C}a + 3\dot{M}g)\,\ddot{S}i^3$	
	218b. Actinolite *	$(\dot{C}a + 3(\dot{M}g, \dot{F}e))\,\ddot{S}i^3$	
	218c. Hornblende *	$(\dot{F}e + 3\dot{M}g)\,\ddot{S}i^3$	
219.	**Acmite**	$\dot{N}a\,\ddot{S}i + \dot{F}e\,\ddot{S}i^2$	4
220.	**Strakonitzite?**	$\dot{C}a, \dot{M}g, \dot{F}e, \ddot{A}l, \ddot{S}i, \dot{H}$	4
221.	**Enstatite**	$\dot{M}g^3 \ddot{S}i^2$	3
222.	**Anthophyllite** *	$(\dot{F}e + 3\dot{M}g)\,\ddot{S}i^3$	3
223.	**Hypersthene** *	$(\dot{F}e, \dot{M}n)^3 \ddot{S}i^2$	3
224.	**Wichtyne**	$(\dot{N}a, \dot{C}a, \dot{M}g, \dot{F}e)^3 \ddot{S}i + \ddot{A}l\,\ddot{S}i^2$	
225.	**Babingtonite** *	$(\dot{C}a, \dot{F}e)^6 \ddot{S}i^6$	5
226.	**Rhodonite** *	$\dot{M}n^5 \ddot{S}i^2$	5
227.	**Beryl** *	$(\frac{1}{2}\ddot{B}e + \frac{1}{2}\ddot{A}l)\,\ddot{S}i^2$	6
228.	**Eudialyte**	$2(\dot{C}a, \dot{N}a, \dot{F}e)^3 \ddot{S}i^2 + \dot{Z}r\,\ddot{S}i^2$	6
	3. *Eulytine Section.*		
229.	**Eulytine**	$\ddot{B}i^2 \ddot{S}i^3$	1
230.	**Leucophane**	$\dot{C}a^5 \ddot{S}i^2 + \ddot{B}e\,\ddot{S}i + Na\,F$	3
231.	**Melinophane**	$* \dot{R}^5 \ddot{S}i^2 + \ddot{R}\,\ddot{S}i + Na\,F$	6?
	4. *Garnet Section.*		
232.	**Peridot**	$\dot{R}^2 \ddot{S}i$	3
	232a. Forsterite *	$\dot{M}g^2 \ddot{S}i$	
	232b. Chrysolite *	$(\dot{M}g, \dot{F}e)^2 \ddot{S}i$	
	232c. Fayalite *	$\dot{F}e^2 \ddot{S}i$	

* $\dot{R} = \dot{C}a.\ \dot{N}a.$ $\ddot{R} = \ddot{A}l.\ \ddot{B}e$

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No.	Name.	Formula.	System of crystallization.
233.	**Tephroite** *	$\dot{M}n^3\ddot{S}i$	2?
234.	**Knebelite**	$(\dot{F}e,\dot{M}n)^3\ddot{S}i$	
235.	**Chondrodite** *	* $\dot{M}g^4\ddot{S}i$	3
336.	**Willemite** *	$\dot{Z}n^3\ddot{S}i$	6
237.	**Phenacite** *	$\ddot{B}e\ddot{S}i$	6
238.	**Garnet**	$\dot{R}^3\ddot{S}i + \ddot{R}\ddot{S}i$	1
	238[a]. Pyrope *	$(\dot{C}a,\dot{M}g)^3\ddot{S}i + (\ddot{A}l,\ddot{F}e)\ddot{S}i$	
	238[b]. Grossular *	$\dot{C}a^3\ddot{S}i + \ddot{A}l\ddot{S}i$	
	238[c]. Almandine *	$\dot{F}e^3\ddot{S}i + \ddot{A}l\ddot{S}i$	
	238[d]. Spessartine *	$\dot{M}n^3\ddot{S}i + \ddot{A}l\ddot{S}i$	
	238[e]. Melanite *	$\dot{C}a^3\ddot{S}i + \ddot{F}e\ddot{S}i$	
	238[f]. Ouvarovite	$\dot{C}a^3\ddot{S}i + (\ddot{C}r\ddot{A}l)\ddot{S}i$	
239.	**Helvin**	$(\dot{M}n,\dot{F}e)^3\ddot{S}i^2 + \ddot{B}e\ddot{S}i + MnS$	1
240.	**Zircon** *	$\ddot{Z}r\ddot{S}i$	2
241.	**Auerbachite**	$\ddot{Z}r\frac{1}{2}\ddot{S}i\frac{1}{4}$	2
242.	**Alvite** ?	$Th?, \dot{Y}, \ddot{Z}r, \ddot{F}e, \ddot{A}l, \ddot{B}e, \ddot{S}i, \dot{H}$	2
243.	**Tachyaphaltite**	$Th?, \ddot{A}l, \ddot{F}e, \ddot{Z}r, \ddot{S}i, \dot{H}$	2
244.	**Idocrase** *	$(\dot{C}a,\dot{M}g,\dot{F}e)^3\ddot{S}i + \ddot{A}l\ddot{S}i$	2
245.	**Sarcolite**	$(\dot{C}a,\dot{N}a)^3\ddot{S}i + \ddot{A}l\ddot{S}i$	2
246.	**Melonite**	$\dot{C}a^3\ddot{S}i + 2\ddot{A}l\ddot{S}i$	2
247.	**Scapolite** *	$\dot{C}a^3\ddot{S}i^2 + 2\ddot{A}l\ddot{S}i$	2
248.	**Melilite**	$2(\dot{C}a,\dot{N}a,\dot{M}g)^3\ddot{S}i + (\ddot{A}l,\ddot{F}e)\ddot{S}i$	2
249.	**Dipyre**	$4(\dot{C}a,\dot{N}a)\ddot{S}i + 3\ddot{A}l\ddot{S}i$	2

* Part of the oxygen is replaced by fluorine in varying proportions.

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No.	Name.	Formula.	System of crystallization.
250.	**Epidote**	$\dot{R}^3\ddot{S}i + 2\dot{R}\ddot{S}i$	5
	250a. Pistacite *	$(\dot{C}a, \dot{F}e)^3\ddot{S}i + 2\dot{A}l\ddot{S}i$	
	250b. Zoisite *	$\dot{C}a^3\ddot{S}i + 2\dot{A}l\ddot{S}i$	
	250c. Piedmontite	$\dot{C}a^3\ddot{S}i + 2(\dot{A}l, \dot{M}n)\ddot{S}i$	
251.	**Allanite** *	$* \dot{R}^3\ddot{S}i + \dot{R}\ddot{S}i$	4
252.	**Partschin**	$(\dot{F}e, \dot{M}n)^3\ddot{S}i + \dot{A}l\ddot{S}i$	4
253.	**Zoisite** *Brooke*	$\dot{C}a^3\ddot{S}i + 2\dot{A}l\ddot{S}i$	4
254.	**Gadolinite**	† $(\dot{R}^3, \dot{R})\ddot{S}i\frac{4}{3}$	4
255.	**Danburite** †	$\dot{C}a^3\ddot{S}i + 3\dot{B}\ddot{S}i$	5
256.	**Axinite** *	‡ $(\dot{R}^3, \dot{R}, \dot{B})\ddot{S}i$	5
257.	**Iolite** *	$(\dot{M}g, \dot{F}e)^3\ddot{S}i^2 + 3\dot{A}l\ddot{S}i$	3
		5. *Mica Section.*	
258.	**Muscovite** *	§ $(\frac{1}{7}\frac{1}{9}\dot{K}^3 + 1\frac{1}{3}\frac{1}{9}\dot{R})\ddot{S}i\frac{4}{3}$	3
259.	**Phlogopite** *	$3(\dot{K}, \dot{M}g)^3\ddot{S}i + 2\dot{A}l\ddot{S}i$	3
260.	**Biotite** *	$(\dot{K}, \dot{M}g)^3\ddot{S}i + (\dot{A}l, \dot{F}e)\ddot{S}i$	3?
261.	**Astrophyllite**	$\dot{K}, \dot{N}a, \dot{C}a, \dot{F}e, \dot{M}n, \dot{T}i, \dot{A}l, \dot{Z}r, \dot{F}e, \ddot{S}i$	
262.	**Lepidomelane**	$(\dot{K}, \dot{F}e)^3\ddot{S}i + 3(\dot{A}l, \dot{F}e)\ddot{S}i$	3?
263.	**Lepidolite** *	$(\dot{K}, \dot{L}i)\ddot{S}i + (\dot{A}l, \dot{F}e)\ddot{S}i$	3
		6. *Feldspar Section.*	
264.	**Sodalite** *	$\dot{N}a^3\ddot{S}i + 3\dot{A}l\ddot{S}i + NaCl$	1
265.	**Lapis Lazuli**	$\dot{N}a, \dot{C}a, \dot{A}l, \dot{F}e, \ddot{S}i, \ddot{S}$	1
266.	**Häuyne**	$\dot{N}a^3\ddot{S}i + 3\dot{A}l\ddot{S}i + 2\dot{C}a\ddot{S}$	1
267.	**Nosean**	$\dot{N}a^3\ddot{S}i + 3\dot{A}l\ddot{S}i + \dot{N}a\ddot{S}$	1
268.	**Skolopsite**	‖ $\dot{R}^3\ddot{S}i^2 + \dot{A}l\ddot{S}i + \frac{1}{2}\dot{N}a\ddot{S}$	

* $\dot{R}$ = Ca. Ce. La. Di. Fe. Mg. $\dot{R}$ = Al Fe † $\dot{R}$ = Ca. Ce. Fe. Y. $\dot{R}$ = Be.
‡ $\dot{R}$ = Ca. $\dot{R}$ = Al. Fe. Mn. § $\dot{R}$ = Al. Fe.
‖ $\dot{R}$ = Na. Ka. Ca. Mg. Mn.

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No.	Name.	Formula.	System of crystallization.
269.	Leucite	$\dot{K}^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i^2$	1
270.	Nepheline *	$(\dot{N}a, \dot{K})^2\ddot{S}i + 2\ddot{A}l\ddot{S}i$	6
271.	Cancrinite *	$\dot{N}a^2\ddot{S}i + 2\ddot{A}l\ddot{S}i + (\dot{N}a, \dot{C}a)\ddot{C} + \dot{H}$	6
272.	Anorthite	$(\dot{N}a, \dot{K}, \dot{C}a, \dot{M}g)^3\ddot{S}i + 3\ddot{A}l\ddot{S}i$	5
273.	Andesine *	$(\dot{C}a, \dot{N}a)^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i^2$	5
274.	Barsowite	$\dot{C}a^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i$	5?
275.	Bytownite?	$\dot{C}a^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i$	
276.	Labradorite *	$(\dot{C}a, \dot{N}a)\ddot{S}i + \ddot{A}l\ddot{S}i$	5
277.	Oligoclase *	$(\dot{C}a, \dot{N}a)\ddot{S}i + \ddot{A}l\ddot{S}i^2$	5
278.	Albite *	$\dot{N}a\ddot{S}i + \ddot{A}l\ddot{S}i^3$	5
279.	Orthoclase *	$\dot{K}\ddot{S}i + \ddot{A}l\ddot{S}i^3$	4
280.	Petalite *	$(\dot{L}i, \dot{N}a)^3\ddot{S}i^4 + 4\ddot{A}l\ddot{S}i^4$	5?
		Appendix.	
281.	Cyclopite	$(\dot{C}a, \dot{N}a)^3\ddot{S}i + 2(\ddot{A}l, \ddot{F}e)\ddot{S}i$	5
282.	Weissigite?	$\dot{N}a, \dot{K}, \dot{L}i, \ddot{A}l, \ddot{S}i$	4
283.	Pollux	$\dot{K}, \dot{N}a, \ddot{A}l, \ddot{F}e, \ddot{S}i$	
284.	Isopyre	$\dot{C}a\ddot{S}i + (\ddot{A}l, \ddot{F}e)\ddot{S}i$	
285.	Silicate of Yttria?	$\dot{Y}, \ddot{S}i$	
286.	Polychroilite	$\dot{M}g, \ddot{A}l, \ddot{F}e, \ddot{S}i, \dot{H}$	6?
		7. *Andalusite Section.*	
287.	Gehlenite	$3(\dot{M}g, \dot{C}a)^3\ddot{S}i + (\ddot{F}e, \ddot{A}l)^3\ddot{S}i$	2
288.	Andalusite *	$*\ \ddot{A}l\ddot{S}i^{\frac{1}{2}}$	3
289.	Topaz *	$*\ \ddot{A}l\ddot{S}i^{\frac{1}{2}}$	3
290.	Staurolide *	$\dagger\ (\ddot{A}l, \ddot{F}e)\ddot{S}i^{\frac{1}{2}}$	3
291.	Carolathine	$\ddot{A}l\ddot{S}i^{\frac{1}{2}}$	

* And $\ddot{A}l\ddot{S}i^{\frac{1}{2}}$. In Topaz part of the oxygen is replaced by fluorine.
† And $\ddot{A}l\ddot{S}i^{\frac{1}{2}}$. Rammelsberg writes the formula $(\dot{R}, \dot{R}^2) + \ddot{S}i^2$.

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No.	Name.	Formula.	System of crystallization.
292.	**Lievrite** *	$3(\dot{F}e, \dot{C}a)^3 \ddot{S}i + \dot{F}e^2 \ddot{S}i$	3
293.	**Kyanite** *	$\dot{A}l \ddot{S}i\frac{1}{2}$	5
294.	**Sillimanite** *	* $\dot{A}l \ddot{S}i\frac{1}{2}$	3
295.	**Sapphirine**	$\dot{M}g, \dot{F}e, \dot{A}l, \ddot{S}i$	3?
296.	**Euclase**	$(\frac{1}{2}\dot{B}e + \frac{1}{2}\dot{A}l) \ddot{S}i\frac{1}{2}$	4
297.	**Sphene** *	$(\dot{C}a, \dot{T}i) \ddot{S}i\frac{1}{2}$	4
298.	**Keilhauite**	$(\dot{Y}, (\dot{C}a, \dot{T}i), \dot{A}l, \dot{F}e, \dot{M}n, \dot{C}r) \ddot{S}i\frac{1}{2}$	4
299.	**Tourmaline** *	† $(\dot{R}^3, \dot{R}, \dot{B}) Si\frac{1}{2}$	6

B. Hydrous Silicates.

I. Magnesian Hydrous Silicates.

1. *Talc Section.*

300.	**Talc** *	$\dot{M}g^6 \ddot{S}i^5 + 2\dot{H}$	3?
301.	**Meerschaum**	$\dot{M}g \ddot{S}i + \dot{H}$?	
302.	**Nsolite**	$(\dot{F}e, \dot{M}g) \ddot{S}i + \frac{1}{3}\dot{H}$?	
303.	**Spadaite**	$\dot{M}g^5 \ddot{S}i^4 + 4\dot{H}$	
304.	**Chlorophæite**	$\dot{F}e \ddot{S}i + 6\dot{H}$?	
305.	**Crocidolite**	$(\dot{N}a, \dot{M}g, \dot{F}e)^6 \ddot{S}i^5 + 2\dot{H}$	4?

2. *Serpentine Section.*

306.	**Picrophyll**	$(\dot{M}g, \dot{F}e)^3 \ddot{S}i^2 + 2\dot{H}$	6?
307.	**Kerolite** *	$\dot{M}g^3 \ddot{S}i^2 + 4\frac{1}{2}\dot{H}$	
308.	**Monradite**	$(\dot{M}g, \dot{F}e)^3 \ddot{S}i^2 + \frac{1}{4}\dot{H}$	
309.	**Aphrodite**	$\dot{M}g^3 \ddot{S}i^2 + 2\frac{1}{4}\dot{H}$	
310.	**Picrosmine**	$\dot{M}g^3 \ddot{S}i^2 + 1\frac{1}{2}\dot{H}$	3
311.	**Saponite** *	$2\dot{M}g^3 \ddot{S}i^2 + \dot{A}l \ddot{S}i + 10\dot{H}$	

* And $\dot{A}l \ddot{S}i\frac{1}{2}$.

† $\dot{R}$ = Fe. Mg. Ca. Na. $\dot{R}$ = Al. Fe.

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No.	Name.	Formula.	System of crystallization.
312.	**Serpentine** *	$\dot{M}g^3\ddot{S}i^2 + 6\dot{H}$	3?
313.	**Deweylite** *	$\dot{M}g^2\ddot{S}i + 3\dot{H}$	
314.	**Hydrophite** *	$(\dot{M}g, \dot{F}e)^2\ddot{S}i + 3\dot{H}$?	
315.	**Nickel Gymnite** *	$(\dot{N}i, \dot{M}g)^2\ddot{S}i + 3\dot{H}$	
		Appendix.	
316.	**Ottrelite** *	$(\dot{F}e, \dot{M}n)^3\ddot{S}i^2 + 2\ddot{A}l\ddot{S}i + 3\dot{H}$	4?
317.	**Groppite**	$(\dot{K}, \dot{C}a, \dot{M}g)^3\ddot{S}i^2 + 2\ddot{A}l\ddot{S}i + 3\dot{H}$	
318.	**Stilpnomelane**	$\dot{F}e^3\ddot{S}i^2 + \ddot{A}l\ddot{S}i^2 + 7\dot{H}$	
319.	**Chalcodite** †	$2(\dot{F}e, \dot{M}g)\ddot{S}i + (\ddot{A}l, \ddot{F}e)\ddot{S}i + 3\dot{H}$	
320.	**Eukamptite**	$(\dot{M}g, \dot{F}e)^3\ddot{S}i + \ddot{A}l\ddot{S}i + \dot{H}$	
321.	**Melanhydrite**	$(\dot{M}g, \dot{F}e, \dot{M}n)^2\ddot{S}i^2 + 2(\ddot{A}l, \ddot{F}e)\ddot{S}i + 12\dot{H}$	
		3. *Chlorite Section.*	
322.	**Hisingerite**	$\dot{F}e^3\ddot{S}i + 2\ddot{F}e\ddot{S}i + 6\dot{H}$	
323.	**Thuringite** *	$2\dot{F}e^3\ddot{S}i + (\ddot{A}l, \ddot{F}e)^3\ddot{S}i + 6\dot{H}$	
324.	**Euphyllite** †	$(\dot{N}a, \dot{K}, \dot{C}a)^3\ddot{S}i + 8\ddot{A}l\ddot{S}i + 6\dot{H}$	
325.	**Pyrosclerite** *	$2\dot{M}g^3\ddot{S}i + \ddot{A}l\ddot{S}i + 6\dot{H}$	6?
326.	**Pseudophite**?	$4(\dot{M}g, \dot{F}e)^3\ddot{S}i + \ddot{A}l^2\ddot{S}i + 9\dot{H}$	
327.	**Thermophyllite**?	$\dot{M}g^3\ddot{S}i\frac{4}{3} + (\ddot{A}l, \ddot{F}e)\ddot{S}i\frac{4}{3} + 2\dot{H}$	
328.	**Chlorite**	$5\dot{R}^3\ddot{S}i\frac{4}{3} + 3\ddot{R}\ddot{S}i\frac{4}{3} + 12\dot{H}$	6
328a.	Chlorite *	$5(\dot{M}g, \dot{F}e)^3\ddot{S}i\frac{4}{3} + 3\ddot{A}l\ddot{S}i\frac{4}{3} + 12\dot{H}$	
328b.	Pennine	$5(\dot{M}g, \dot{F}e)^3\ddot{S}i\frac{4}{3} + 3(\ddot{A}l, \ddot{F}e)\ddot{S}i\frac{4}{3} + 12\dot{H}$	
328c.	Clinochlore *	$5\dot{M}g\ddot{S}i\frac{4}{3} + 3\ddot{A}l\ddot{S}i\frac{4}{3} + 12\dot{H}$	
329.	**Delessite**	$(\dot{M}g, \dot{F}e)^3\ddot{S}i\frac{4}{3} + (\ddot{A}l, \ddot{F}e)\ddot{S}i\frac{4}{3} + 3\dot{H}$	6?
330.	**Ripidolite** *G. Rose*	$(\dot{M}g, \dot{F}e)^3\ddot{S}i\frac{4}{3} + \ddot{A}l\ddot{S}i\frac{4}{3} + 3\dot{H}$	6
331.	**Clintonite** *	$\dot{C}a, \dot{M}g, \dot{F}e, \ddot{A}l, \ddot{S}i, \dot{H}$	
332.	**Chloritoid** *	$(\dot{F}e, \dot{M}g)^3\ddot{S}i\frac{4}{3} + 2\ddot{A}l\ddot{S}i\frac{4}{3} + 3\dot{H}$	

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No.	Name.	Formula.	System of crystallization.
333.	Cronstedtite	$(\dot{M}g, \dot{F}e, \dot{M}n)^3\ddot{S}i_{\frac{1}{2}} + \dot{F}e\ddot{S}i_{\frac{1}{2}} + 3\dot{H}$	6
334.	Sideroschisolite	$\dot{F}e^3\ddot{S}i_{\frac{1}{2}} + \frac{1}{2}\dot{H}$	6
335.	Margarite *	$(\dot{N}a, \dot{C}a)^3\ddot{S}i + 3\ddot{A}l^2\ddot{S}i + 3\dot{H}$	3
336.	Ephesite	$\dot{N}a, \dot{K}, \dot{C}a, \ddot{A}l, \ddot{S}i, \dot{H}$	

II. Non-Magnesian Hydrous Silicates.

1. *Pyrophyllite Section.*

337.	Pyrophyllite *	$\ddot{A}l\ddot{S}i^3 + 1\frac{1}{2}\dot{H}$	8
338.	Pholerite *	$\ddot{A}l^3\ddot{S}i^4 + 6\dot{H}$	
339.	Anthosiderite	$\dot{F}e\ddot{S}i^3 + \dot{H}$	

2. *Pectolite Section.*

340.	Apophyllite *	$(\dot{C}a, \dot{K})^3\ddot{S}i^2 + 2\dot{H}$	2
341.	Pectolite *	$(\dot{C}a, \dot{N}a)^4\ddot{S}i^3 + \dot{H}$	4
342.	Okenite	$\dot{C}a^3\ddot{S}i^4 + 6\dot{H}$	3?
343.	Laumontite *	$\dot{C}a^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i^2 + 12\dot{H}$	4
344.	Leonhardite *	$\dot{C}a^3\ddot{S}i^2 + 3\ddot{A}l\ddot{S}i^2 + 9\dot{H}$	4
345.	Cataplelite	$(\dot{N}a, \dot{C}a)^3\ddot{S}i^2 + 2\ddot{Z}r\ddot{S}i^2 + 6\dot{H}$	6
346.	Dioptase	$\dot{C}u^3\ddot{S}i^2 + 3\dot{H}$	6
347.	Chrysocolla *	$\dot{C}u^3\ddot{S}i^2 + 6\dot{H}$	
348.	Demidoffite	$\dot{C}u, \ddot{S}i, \dot{H}$	
349.	Pyrosmalite	$*\ 4(\dot{R}^3\ddot{S}i + 2\dot{R}^3\ddot{S}i^2 + 6\dot{H}) + 3\dot{F}eCl$	6
350.	Portite	$\ddot{A}l\ddot{S}i^2 + 2\dot{H}$	3

3. *Calamine Section.*

351.	Tritomite	$\dagger\ \ddot{R}\ddot{S}i + 2\dot{H}$?	1
352.	Thorite	$\ddot{T}h^3\ddot{S}i + 3\dot{H}$	2
353.	Cerite	$(\dot{C}e, \dot{L}a, \dot{D}i)^3\ddot{S}i + \dot{H}$	6

* $\dot{R} = \dot{F}e, \dot{M}n.$ † $\ddot{R} = \ddot{C}e. \ddot{L}a.$

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No.	Name.	Formula.	System of crystallization.
354.	**Calamine** *	$\dot{Z}n^3\ddot{S}i + 1\frac{1}{2}\dot{H}$	3
355.	**Prehnite** *	$\dot{C}a^2\ddot{S}i + \dot{A}l\ddot{S}i + \dot{H}$	3
356.	**Chlorastrolite** †	$(\dot{C}a, \dot{N}a)^3\ddot{S}i + 2(\dot{A}l, \dot{F}e)\ddot{S}i + 3\dot{H}$	
357.	**Savite**	$(\dot{N}a, \dot{M}g)^3\ddot{S}i^2 + \dot{A}l\ddot{S}i + 2\dot{H}$	3
358.	**Schneiderite**	$3(\dot{C}a, \dot{M}g)^3\ddot{S}i^2 + \dot{A}l^3\ddot{S}i^2 + 3\dot{H}$	
359.	**Carpholite**	$(\dot{A}l, \dot{F}e, \dot{M}n)\ddot{S}i + 1\frac{1}{2}\dot{H}$	3
	4. Zeolite Section.		
360.	**Analcime** *	$\dot{N}a^3\ddot{S}i^2 + 3\dot{A}l\ddot{S}i^2 + 6\dot{H}$	1
361.	**Ittnerite**	$(\dot{N}a, \dot{C}a)^3\ddot{S}i + 3\dot{A}l\ddot{S}i + 6\dot{H}$	1
362.	**Paujasite**	$(\dot{N}a, \dot{C}a)\ddot{S}i + \dot{A}l\ddot{S}i^2 + 9\dot{H}$	1
363.	**Chabazite** *	$(\dot{C}a, \dot{N}a, \dot{K})^4\ddot{S}i^2 + 3\dot{A}l\ddot{S}i^2 + 18\dot{H}$	6
364.	**Gmelinite**	$(\dot{C}a, \dot{N}a, \dot{K})^3\ddot{S}i^4 + 3\dot{A}l\ddot{S}i^2 + 18\dot{H}$	6
365.	**Levyne**	$\dot{C}a\ddot{S}i + \dot{A}l\ddot{S}i + 4\dot{H}$	6
366.	**Gismondine**	$(\dot{C}a, \dot{K})^2\ddot{S}i + 2\dot{A}l\ddot{S}i + 9\dot{H}$	2
367.	**Edingtonite**	$3\dot{B}a\ddot{S}i + 4\dot{A}l\ddot{S}i + 12\dot{H}$	2
368.	**Harmotome**	$\dot{B}a\ddot{S}i + \dot{A}l\ddot{S}i^2 + 5\dot{H}$	3
369.	**Phillipsite**	$(\dot{C}a, \dot{K})\ddot{S}i + \dot{A}l\ddot{S}i^2 + 5\dot{H}$	3
370.	**Thomsonite** *	$(\dot{C}a, \dot{N}a)^3\ddot{S}i + 3\dot{A}l\ddot{S}i + 7\dot{H}$	3
371.	**Natrolite** *	$\dot{N}a\ddot{S}i + \dot{A}l\ddot{S}i + 2\dot{H}$	3
372.	**Scolecite**	$\dot{C}a\ddot{S}i + \dot{A}l\ddot{S}i + 3\dot{H}$	4
373.	**Ellagite**	$\dot{C}a^3\ddot{S}i^4 + \dot{A}l\ddot{S}i + 12\dot{H}$	4?
374.	**Sloanite**	$(\dot{C}a, \dot{M}g)^4\ddot{S}i^2 + 5\dot{A}l\ddot{S}i + 9\dot{H}$	3
375.	**Epistilbite**	$(\dot{C}a, \dot{N}a)\ddot{S}i + \dot{A}l\ddot{S}i^4 + 5\dot{H}$	3
376.	**Heulandite** *	$\dot{C}a\ddot{S}i + \dot{A}l\ddot{S}i^3 + 5\dot{H}$	4
377.	**Brewsterite**	$(\dot{S}r, \dot{B}a)\ddot{S}i + \dot{A}l\ddot{S}i^3 + 5\dot{H}$	4
378.	**Stilbite** *	$\dot{C}a\ddot{S}i + \dot{A}l\ddot{S}i^3 + 6\dot{H}$	3
379.	**Caporcianite**	$\dot{C}a^3\ddot{S}i^2 + 3\dot{A}l\ddot{S}i^2 + 9\dot{H}$	4

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No.	Name.	Formula.	System of crystallization.
		5. Datholite Section.	
380.	**Datholite** *	$2\dot{C}a^3\ddot{S}i + \dot{B}^3\ddot{S}i^3 + 3\dot{H}$	4
381.	**Allophane** *	$\dot{A}l^3\ddot{S}i^3 + 15\dot{H}$	
382.	**Schrötterite** *	$\dot{A}l^4\ddot{S}i + 3\dot{H}$	
		Appendix to Hydrous Silicates.	
383.	**Chloropal**	$\dot{F}e\ddot{S}i^2 + 3\dot{H}$	
384.	**Collyrite**	$\dot{A}l^3\ddot{S}i + 15\dot{H}$	
385.	**Wolchonskoite**	$*\dot{R}\ddot{S}i + 2\frac{1}{2}\dot{H}$?	
386.	**Chrome Ochre**	$(\dot{A}l, \dot{C}r)^3\ddot{S}i^4 + 4\dot{H}$	
387.	**Pimelite**	$(\dot{N}i, \dot{M}g)^3\ddot{S}i + 2(\dot{A}l, \dot{F}e)\ddot{S}i + 9\dot{H}$	
388.	**Montmorillonite**	$\dot{C}a, \dot{K}, \dot{A}l, \dot{F}e, \ddot{S}i, \dot{H}$	
389.	**Delanovite** ?	$\dot{M}n^3\ddot{S}i^2 + 2\dot{A}l\ddot{S}i^2 + 45\dot{H}$	
390.	**Erdmanite**	$\dot{C}a, \dot{F}e, \dot{M}n, \dot{Y}, \dot{C}e, \dot{L}a, \dot{A}l, \ddot{S}i, \dot{H}$	
391.	**Bavalite**	$\dot{C}a, \dot{M}g, \dot{A}l, \dot{F}e, \ddot{S}i, \dot{H}$	
		C. Unarranged Silicates containing Titanic Acid.	
392.	**Tscheffkinite**	$((\dot{C}a, \dot{T}i), \dot{C}e, \dot{L}a, \dot{A}l)\ddot{S}i\frac{3}{2}$	
393.	**Schorlomite** †	$\dagger\ 2\dot{R}^3\ddot{S}i\frac{1}{2} + 3\dot{R}\ddot{S}i\frac{1}{2}$	1
394.	**Mosandrite**	$\ddagger\ \dot{R}^3\ddot{S}i + 2\dot{R}\ddot{S}i + 4\frac{1}{2}\dot{H}$	3
395.	**Wölherite**	$6(\dot{N}a, \dot{C}a)^3\ddot{S}i + 3\dot{Z}r\ddot{S}i + \dot{C}b\ddot{S}i$	3
		Appendix.	
396.	**Turnerite** ?	$\dot{C}a, \dot{M}g, \dot{A}l, \ddot{S}i$?	4

* $\dot{R}$ = Cr. Al. Fe.
† $\dot{R}$ = Ca. $\dot{R}$ = (Ca. Ti). Fe.
‡ $\dot{R}$ = Ca. $\dot{R}$ = (Ca. Ti). Ce. D. La.

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No.	Name.	Formula.	System of crystallization.
	2. Titanates, Tungstates, Molybdates, Tantalates, Columbates, Chromates, Vanadates.		
397.	**Perofskite**	$\dot{C}a\,\dot{T}i$	1
398.	**Pyrochlore** *	$4(\dot{C}a, \dot{M}g, \dot{C}e, \dot{L}a, \dot{Y}, \dot{U})\,(\dot{T}i, \bar{C}b)$	1
399.	**Pyrrhite**	$\dot{C}e, \dot{Z}r, \bar{C}b$	1
400.	**Scheelite** *	$\dot{C}a\,\dot{W}$	2
401.	**Scheeletine** *	$\dot{P}b\,\dot{W}$	2
402.	**Tungstate of Copper?** †	$\dot{C}u, \dot{C}a, \dot{W}$	
403.	**Wulfenite** *	$\dot{P}b\,\dot{M}o$	2
404.	**Azorite**	$\dot{C}a, \bar{C}b$	2
405.	**Fergusonite**	$(\dot{Y}, \dot{C}e)^6\,\bar{C}b$	2
406.	**Tyrite?**	$\dot{Y}, \dot{C}e, \dot{F}e, \dot{U}, \dot{A}l, \bar{C}b$	2
407.	**Adelpholite**	$\dot{F}e, \dot{M}n\,\dot{T}a$	2
408.	**Tantalite**	$(\dot{F}e, \dot{M}n)\,\dot{T}a$	3
409.	**Wolfram** *	$2\dot{F}e\dot{W}+3\dot{M}n\dot{W}$ and $4\dot{F}e\dot{W}+\dot{M}n\dot{W}$	3
410.	**Columbite** *	$(\dot{F}e, \dot{M}n)\,\bar{C}b$	3
411.	**Paracolumbite?** †	$\dot{F}e, \dot{U}$, and a metallic acid.	
412.	**Samarskite** *	$\dot{Y}, \dot{C}e, \dot{L}a, \dot{F}e, \bar{U}, \bar{C}b$	3
413.	**Mengite**	$\dot{F}e, \dot{Z}r, \dot{T}i$	3
414.	**Polymignyte** *	$\dot{Y}, \dot{T}i, \dot{Z}r, \dot{F}e, \bar{C}e,$	3
415.	**Polycrase**	$\dot{U}, \dot{T}i, \dot{Z}r, \dot{F}e, \bar{C}e, \bar{C}b$	3
416.	**Æschynite**	$2(\dot{C}e, \dot{L}a, \dot{Y}, \dot{F}e)\,\bar{C}b+\bar{C}e, \dot{T}i^3$	3
417.	**Euxenite**	$\dot{C}a, \dot{M}g, \dot{Y}, \dot{C}e, \dot{L}a, \dot{U}, \dot{T}i, \bar{C}b$	3?
418.	**Yttro-Tantalite**	$*\,\dot{R}^3\,(\dot{T}a, \dot{W}, \bar{U})$	3
419.	**Parathorite** †	$\dot{F}e, \dot{T}i$?	3
420.	**Rutherfordite** †	$\dot{C}e, \dot{Y}, \dot{C}a, \dot{T}i$	4

* In the yellow $\dot{R} = \dot{Y}$. In the black $\dot{R} = \dot{Y}, \dot{C}a, \dot{F}e$. In the brown $\dot{R} = \dot{Y}, \dot{C}a$.

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No.	Name.	Formula.	System of crystallization.
421.	**Crocoisite**	$\dot{P}b\,\bar{C}r$	4
422.	**Vauquelinite** *	$(\dot{C}u, \dot{P}b)^3\,\bar{C}r^2$	4
423.	**Melanochroite**	$\dot{P}b^3\,\bar{C}r^2$	3?
424.	**Dechenite**	$2(\dot{P}b, \dot{Z}n)^3\,\bar{V} + (\dot{P}b, \dot{Z}n)^3\,\bar{A}s$	
425.	**Descloizite**	$\dot{P}b^2\,\bar{V}$	3
426.	**Vanadinite**	$\dot{P}b^3\,\bar{V} + \frac{1}{3}\dot{P}b\,Cl$	6
427.	**Volborthite**	$(\dot{C}u, \dot{C}a)^4\,\bar{V} + \dot{H}$	6
428.	**Pateraite?**	$\dot{C}u, \dot{C}o, \bar{V}$	

3. Sulphates and Selenates.

1. Anhydrous Sulphates.

1. *Trimetric.*

429.	**Glaserite**	$\dot{K}\,\bar{S}$	3
430.	**Thenardite**	$\dot{N}a\,\bar{S}$	3
431.	**Barytes** *	$\dot{B}a\,\bar{S}$	3
432.	**Celestine** *	$\dot{S}r\,\bar{S}$	3
433.	**Anhydrite** *	$\dot{C}a\,\bar{S}$	3
434.	**Anglesite** *	$\dot{P}b\,\bar{S}$	3
435.	**Almagrerite**	$\dot{Z}n\,\bar{S}$	3
436.	**Leadhillite** *	$\dot{P}b\,\bar{S} + 3\dot{P}b\,\bar{C}$	3
437.	**Caledonite** *	$\dot{P}b\,\bar{S}, \dot{P}b\,\bar{C}, \dot{C}u\,\bar{C}$	3

2. *Rhombohedral.*

438.	**Dreelite**	$\dot{C}a\,\bar{S} + 3\dot{B}a\,\bar{S}$	6
439.	**Susannite**	$\dot{P}b\,\bar{S} + 3\dot{P}b\,\bar{C}$	6

3. *Monoclinic.*

440.	**Glauberite**	$(\frac{1}{2}\dot{N}a + \frac{1}{2}\dot{C}a)\,\bar{S}$	4
441.	**Lanarkite**	$\dot{P}b\,\bar{S} + \dot{P}b\,\bar{O}$	4

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No.	Name.	Formula.	System of crystallization.
		Appendix to Anhydrous Sulphates.	
442.	Reussin	$\dot{N}a\,\bar{S}$, $\dot{M}g\,\bar{S}$, Ca Cl	
443.	Selenate of Lead	$\dot{P}b\,\bar{S}e$	1?
444.	Connellite	$\dot{C}u\,\bar{S}$, Cu Cl?	6
445.	Alumian	$\dot{A}l\,\bar{S}^3$	6?
		2. Hydrous Sulphates.	
446.	Misenite	$\dot{K}\,\bar{S} + \dot{H}\,\bar{S}$	
447.	Polyhalite	$(\dot{K}, \dot{C}a, \dot{M}g)\,\bar{S} + \frac{1}{2}\dot{H}$	3
448.	Gypsum *	$\dot{C}a\,\bar{S} + 2\dot{H}$	4
449.	Astrakanite	$\dot{N}a\,\bar{S} + \dot{M}g\,\bar{S} + 4\dot{H}$	
450.	Löweite	$\dot{N}a\,\bar{S} + \dot{M}g\,\bar{S} + 2\frac{1}{2}\dot{H}$	
451.	Mascagnine	$\dot{N}H^4\,\bar{S} + \dot{H}$	3
452.	Lecontite	$(\dot{N}a, \dot{N}H^4)\,\bar{S} + 2\dot{H}$	3
453.	Coquimbite	$\dot{F}e\,\bar{S}^3 + 9\dot{H}$	6
454.	Rœmerite	$(\dot{F}e, \dot{Z}n)\,\bar{S} + \dot{F}e\,\bar{S}^3 + 12\dot{H}$	4
455.	Cyanosite *	$\dot{C}u\,\bar{S} + 5\dot{H}$	
456.	Cyanochrome	$(\frac{1}{2}\dot{K} + \frac{1}{2}\dot{C}u)\,\bar{S} + 3\dot{H}$	4
457.	Picromerid	$(\dot{M}g, \dot{C}u)\,\bar{S} + 3\dot{H}$	4
458.	Alunogen *	$\dot{A}l\,\bar{S}^3 + 18\dot{H}$	
459.	Alum	$\dot{R}\,\bar{S} + \dot{A}l\,\bar{S}^3 + 24\dot{H}$	1
	459a. Potash Alum *	$\dot{K}\,\bar{S}$ + " "	
	459b. Solfatarite	$\dot{N}a\,\bar{S}$ + " "	
	459c. Tschermigite	$\dot{N}H^4\,\bar{S}$ + " "	
	459d. Pickeringite	$\dot{M}g\,\bar{S}$ + " "	
	459e. Halotrichite *	$\dot{F}e\,\bar{S}$ + " "	
	459f. Apjohnite *	$\dot{M}n\,\bar{S}$ + " "	

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No.	Name.	Formula.	System of crystallization.
460.	Voltaite	$\dot{F}e\,\ddot{S} + \dot{F}e_2\ddot{S}^3 + 24\dot{H}$	1
461.	Epsomite *	$\dot{M}g\,\ddot{S} + 7\dot{H}$	3
462.	Tauriscite ?	$\dot{F}e\,\ddot{S} + 7\dot{H}$	3
463.	Mangan Vitriol ?	$\dot{M}n, \ddot{S}, \dot{H}$	
464.	Goslarite	$\dot{Z}n\,\ddot{S} + 7\dot{H}$	
465.	Copperas *	$\dot{F}e\,\ddot{S} + 7\dot{H}$	4
466.	Bieberite	$(\dot{C}o, \dot{M}g)\,\ddot{S} + 7\dot{H}$	4
467.	Pyromeline *	$\dot{N}i, \ddot{S}, \dot{H}$	6?
468.	Morenosite	$\dot{N}i, \ddot{S}, \dot{H}$	
469.	Johannite	$2(\dot{U}\ddot{S})\,\ddot{S} + (\dot{C}u\,\ddot{S}) + 4\dot{H}$	4
470.	Basic Sulphate of Uranium	$2(\dot{U}\ddot{S})^3\,\ddot{S}^2 + {}'\dot{C}a, \dot{C}u)\,\ddot{S} + 10\dot{H}$	
471.	Glauber Salt *	$\dot{N}a\,\ddot{S} + 10\dot{H}$	4
472.	Botryogen	$\dot{F}e^3\ddot{S}^2 + 3\dot{F}e\,\ddot{S}^2 + 36\dot{H}$	4
473.	Copiapite	$\dot{F}e^2\ddot{S}^5 + 18\dot{H}$	
474.	Apatelite	$2\dot{F}e^2\ddot{S}^3 + 3\dot{H}$	
475.	Alunite *	$\dot{K}\,\ddot{S} + 3\dot{A}l\,\ddot{S} + 6\dot{H}$	6
476.	Jarosite	$\dot{K}\,\ddot{S} + 4\dot{F}e\,\ddot{S} + 9\dot{H}$	6
477.	Websterite	$\dot{A}l\,\ddot{S} + 9\dot{H}$	
478.	Loewigite	$\dot{K}\,\ddot{S} + 3\dot{A}l\,\ddot{S} + 9\dot{H}$	
479.	Pissophane	$(\dot{F}e, \dot{A}l)^5\,\ddot{S}^2 + 30\dot{H}$	
480.	Linarite	$\dot{P}b\,\ddot{S} + \dot{C}u\,\dot{H}$	4
481.	Brochantite *	$\dot{C}u^4\,\ddot{S} + 3\dot{H}$	3
482.	Lettsomite	$(\dot{C}u^6\,\ddot{S} + 3\dot{H}) + (\dot{A}l\,\ddot{S} + 9\dot{H})$	
483.	Medjidite	$\ddot{U}\,\ddot{S} + \dot{C}a\,\ddot{S} + 15\dot{H}$	
484.	Uranochre	$3\ddot{U}^2\ddot{S} + 14\dot{H}$ and $2\ddot{U}^2\ddot{S} + \dot{C}a\,\ddot{S} + 28\dot{H}$	
485.	Uranochalcite	$\dot{U}\,\ddot{U} + 2\dot{C}a\,\ddot{S} + \dot{C}u\,\ddot{S} + 18\dot{H}$	

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No.	Name.	Formula.	System of crystallization.
		4. Borates.	
486.	Boracite	$2(\dot{M}g^3\ddot{B}^4) + Mg\,Cl$	1
487.	Rhodizite	$\dot{C}a^3\ddot{B}^4$?	1
488.	Hydroboracite	$\dot{C}a^3\ddot{B}^4 + \dot{M}g^3\ddot{B}^4 + 18\dot{H}$	
489.	Hayesine	$\dot{C}a\,\ddot{B}^4 + 10\dot{H}$	
490.	Boronatrocalcite	$\dot{N}a\,\ddot{B}^4 + \dot{C}a^3\,\ddot{B}^6 + 12\dot{H}$	
491.	Borax *	$\dot{N}a\,\ddot{B}^2 + 10\dot{H}$	4
492.	Lagonite	$\dot{F}e\,\ddot{B}^3 + 3\dot{H}$	
493.	Larderellite	$\dot{N}H^4\,\ddot{B}^4 + 4\dot{H}$	
494.	Warwickite †	$\dot{M}g, \dot{F}e, \dot{T}i, \ddot{B}$	4
		5. Phosphates, Arsenates, Antimonates, Nitrates.	
		a. Anhydrous.	
		1. *Hexagonal.*	
495.	Apatite *	$\dot{C}a^3\ddot{P} + \frac{1}{3}Ca\,(Cl, F)$	6
496.	Hydroapatite	$\dot{C}a^3\ddot{P} + \frac{1}{3}Ca\,F + \dot{H}$	
497.	Cryptolite	$\dot{C}e^3\ddot{P}$	6
498.	Pyromorphite *	$\dot{P}b^3\ddot{P} + \frac{1}{3}Pb\,Cl$	6
499.	Mimetene*	$(\dot{P}b, \dot{C}a)^3\,(\ddot{A}s, \ddot{P}) + \frac{1}{3}Pb\,Cl$	6
		2. *Dimetric.*	
500.	Xenotime *	$(\dot{Y}, \dot{C}e)^1\ddot{P}$	2
		3. *Monoclinic.*	
501.	Monazite *	$(\dot{C}e, \dot{L}a, \dot{T}h)^3\ddot{P}$	4
502.	Wagnerite	$\dot{M}g^3\ddot{P} + Mg\,F$	4
503.	Kühnite	$(\dot{C}a, \dot{M}g, \dot{M}n)^3\ddot{A}s$	
504.	Lazulite *	$2(\dot{M}g, \dot{F}e)^3\ddot{P} + \ddot{A}l^6\ddot{P}^3 + 5\dot{H}$	4
505.	Turquois *	$\ddot{A}l^2\ddot{P} + 5\dot{H}$	
506.	Conarite?	$\dot{N}i, \ddot{P}, \dot{H}$	4?

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No.	Name.	Formula.	System of crystallization.
		4. *Trimetric.*	
507	**Triphyline** *	$(\dot{F}e, \dot{M}n, \dot{L}i)^3 \ddot{P}$	3
508.	**Triplite**	$(\dot{M}n, \dot{F}e)^4 \ddot{P}$	3
509.	**Fischerite**	$\ddot{A}l^2 \ddot{P} + 8\dot{H}$	3
		Appendix.	
510.	**Hopeite**	$\dot{Z}n, \ddot{P}, Aq$	3
511.	**Amblygonite** *	$(2(\dot{L}i, \dot{N}a)^3 \ddot{P} + 2\ddot{A}l \ddot{P}) + (Al^3F^3 + \ddot{A}l)$	3
512.	**Herderite**	$\ddot{A}l, \dot{C}a, \ddot{P}, F$	3
513.	**Carminite**	$\dot{P}b^3 \ddot{A}s + 5\dot{F}e \ddot{A}s$	3?
514.	**Romeine**	$\dot{C}a^3, \ddot{S}b, \ddot{S}b$	2
		b. Hydrous.	
515.	**Thrombolite**	$\dot{C}u^3 \ddot{P}^2 + 6\dot{H}$?	
516.	**Stercorite**	$(\dot{N}a, \dot{N}H^4) \ddot{P} + 9\dot{H}$	
517.	**Struvite**	$\dot{N}H^4 \dot{M}g^2 \ddot{P} + 12\dot{H}$	
518.	**Haidingerite**	$\dot{C}a^2 \ddot{A}s + 4\dot{H}$	3
519.	**Pharmacolite**	$\dot{C}a^2 \ddot{A}s + 6\dot{H}$	4
520.	**Vivianite** *	$\dot{F}e^3 \ddot{P} + 8\dot{H}$	4
521.	**Erythrine** *	$\dot{C}o^3 \ddot{A}s + 8\dot{H}$	4
522.	**Hörnesite**	$\dot{M}g^3 \ddot{A}s + 8\dot{H}$	4
523.	**Roessalerite**	$\dot{M}g^3 \ddot{A}s + 15\dot{H}$	
524.	**Annabergite** *	$\dot{N}i^3 \ddot{A}s + 8H$	
525.	**Köttigite**	$(\dot{Z}n, \dot{C}o, \dot{N}i)^3 \ddot{A}s + 8\dot{H}$	4
526.	**Symplesite**	$3\dot{F}e \ddot{A}s^2 + 8\dot{H}$	4
527.	**Trichalcite**	$\dot{C}u^3 \ddot{A}s + 5\dot{H}$	
528.	**Scorodite** *	$\dot{F}e \ddot{A}s + 4\dot{H}$	3
529.	**Libethenite**	$\dot{C}u^4 \ddot{P} + \dot{H}$	3

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No.	Name.	Formula.	System of crystallization.
530.	**Olivenite**	$\dot{C}u^4(\ddot{A}s,\ddot{P})+\dot{H}$	3
531.	**Conichalcite**	$(\dot{C}u,\dot{C}a)^4(\ddot{P},\ddot{A}s)+1\frac{1}{2}\dot{H}$	
532.	**Euchroite**	$\dot{C}u^4\ddot{A}s+7\dot{H}$	3
533.	**Arseniosiderite**	$\dot{C}a^6\ddot{A}s+4\dot{F}e^2\ddot{A}s+15\dot{H}$	1
534.	**Pharmacosiderite**	$\dot{F}e^4\ddot{A}s^3+18\dot{H}$	1
535.	**Wavellite** *	$\ddot{A}l^3\ddot{P}^2+12\dot{H}$	3
536.	**Cacoxene** *	$\dot{F}e^2\ddot{P}+12\dot{H}$	
537.	**Childrenite** *	$((\dot{M}g,\dot{F}e,\dot{M}n)^3,\ddot{A}l)^4\ddot{P}^3+15\dot{H}$	3
538.	**Erinite**	$\dot{C}u^5\ddot{A}s+2\dot{H}$	
539.	**Cornwallite**	$\dot{C}u^5\ddot{A}s+5\dot{H}$	
540.	**Phosphochalcite** *	$\dot{C}u^6\ddot{P}+2\frac{1}{2}\dot{H}$	3
541.	**Tagilite**	$\dot{C}u^4\ddot{P}+3\dot{H}$	
542.	**Tyrolite**	$Cu^5\ddot{A}s+10\dot{H}+\dot{C}a\ddot{C}$?	3
543.	**Delvauxene**	$\dot{F}e^2\ddot{P}+24\dot{H}$	
544.	**Dufrenite** *	$\dot{F}e^7\ddot{P}+2\frac{1}{2}\dot{H}$	3
545.	**Aphanesite**	$\dot{C}u^6\ddot{A}s+3\dot{H}$	4
546.	**Chaloophyllite**	$\dot{C}u^6\ddot{A}s+12\dot{H}$	6
547.	**Lirocconite**	$5\dot{C}u^5\ddot{A}s+\ddot{A}l^3\ddot{P}+75\dot{H}$	4
548.	**Uranite** *	$(\dot{C}a,\ddot{U}^2)\ddot{P}+12\dot{H}$	3
549.	**Chalcolite**	$(Cu,\ddot{U}^2)\ddot{P}+8\dot{H}$	2
550.	**Carphosiderite**	$\dot{F}e,\ddot{P},\dot{H}$	
551.	**Plumbo Resinite**	$\dot{P}b^3\ddot{P}+6\ddot{A}l\dot{H}$	
552.	**Calcoferrite**	$6(\dot{C}a,\dot{M}g),3(\ddot{A}l,\dot{F}e),4\ddot{P},20\dot{H}$	

Sulphato-Phosphates.

553.	**Pittiolite** *Haus* *	$\dot{F}e^2\ddot{S}^3+2\dot{F}e\ddot{A}s+24\dot{H}$	
554.	**Diadochite**	$\dot{F}e^3\ddot{P}^2+2\dot{F}e\ddot{S}^2+36\dot{H}$	

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No.	Name.	Formula.	System of crystallization.
		Appendix.	
555.	Lindackerite?	$2\dot{C}u^3\dot{A}s + \dot{N}i^3\ddot{S} + 8\dot{H}$	3
		c. NITRATES.	
556.	Nitrammite *	$\dot{N}H^4\ddot{N}$	
557.	Nitre *	$\dot{K}\ddot{N}$	3
558.	Nitratine	$\dot{N}a\ddot{N}$	6
559.	Nitrocalcite *	$\dot{C}a\ddot{N} + \dot{H}$	
		6. Carbonates.	
		1. *Anhydrous Carbonates.*	
560.	Calcite *	$\dot{C}a\ddot{C}$	6
561.	Magnesite *	$\dot{M}g\ddot{C}$	
562.	Dolomite *	$(\dot{C}a, \dot{M}g)\ddot{C}$	6
563.	Breunnerite	$(\dot{M}g, \dot{F}e, \dot{M}n)\ddot{C}$	
564.	Chalybite *	$\dot{F}e\ddot{C}$	6
565.	Diallogite *	$\dot{M}n\ddot{C}$	6
566.	Smithsonite *	$\dot{Z}n\ddot{C}$	6
567.	Aragonite *	$\dot{C}a\ddot{C}$	3
568.	Witherite	$\dot{B}a\ddot{C}$	3
569.	Strontianite *	$\dot{S}r\ddot{C}$	3
570.	Bromlite	$\dot{B}a\ddot{C} + \dot{C}a\ddot{C}$	3
571.	Manganocalcite	$\dot{M}n\ddot{C}, \dot{F}e\ddot{C}, \dot{C}a\ddot{C}, \dot{M}g\ddot{C}$	3?
572.	Cerusite *	$\dot{P}b\ddot{C}$	3
573.	Barytocalcite	$\dot{B}a\ddot{C} + \dot{C}a\ddot{C}$	4
		2. *Hydrous Carbonates.*	
574.	Bicarbonate of Ammonia	$\dot{N}H^4\ddot{C}^2 + \dot{H}$	
575.	Trona *	$\dot{N}a^3\ddot{C}^3 + 4\dot{H}$	4

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No.	Name.	Formula.	System of crystallization.
576.	**Thermonatrite**	$\dot{N}a\,\ddot{C} + \dot{H}$	3
577.	**Natron** *	$\dot{N}a\,\ddot{C} + 10\dot{H}$	4
578.	**Gay-Lussite**	$\dot{N}a\,\ddot{C} + \dot{C}a\,\ddot{C} + 5\dot{H}$	4
579.	**Lanthanite** *	$\dot{L}a\,\ddot{C} + 3\dot{H}$	3
580.	**Hydromagnesite** *	$\dot{M}g^4\,\ddot{C}^3 + 4\dot{H}$	4
581.	**Hydrocalcite**	$\dot{C}a\,\ddot{C} + 5\dot{H}$	6
582.	**Malachite** *	$\dot{C}u^2\,\ddot{C} + \dot{H}$	4
583.	**Azurite** *	$2\dot{C}u\,\ddot{C} + \dot{C}u\,\dot{H}$	4
584.	**Auricalcite** *	$2(\dot{Z}n, \dot{C}u)\,\ddot{C} + 3(\dot{Z}n, \dot{C}u)\,\dot{H}$	
585.	**Zinc Bloom** *	$\dot{Z}n^3\,\ddot{C} + 3\dot{H}$	
586.	**Emerald Nickel** *	$\dot{N}i^3\,\ddot{C} + 6\dot{H}$	
587.	**Remingtonite** †	$\dot{C}o\,\ddot{C} + Aq$?	
588.	**Zippeite** *	$\ddot{U}^3\ddot{S}^2 + 12\dot{H}$ and $\ddot{U}^3\ddot{S}^2 + \dot{C}u\ddot{S} + 12\dot{H}$	
589.	**Liebigite**	$\ddot{U}\,\ddot{C} + \dot{C}a\,\ddot{C} + 20\dot{H}$	
590.	**Voglite**	$2\ddot{U}\,\ddot{C} + \dot{C}a\,\ddot{C} + \dot{C}u^2\,\ddot{C}^2 + 14\dot{H}$	
591.	**Bismutite** *	$\ddot{B}i^4\,\ddot{C}^3\,\dot{H}^4$	

3. *Carbonates with a Chloride or Fluoride.*

592.	**Parisite**	$8(\dot{C}e,\dot{L}a,\dot{D})\ddot{C} + 2CaF + (\dot{C}e,\dot{L}a,\dot{D})\dot{H}^2\,6$	
593.	**Kischtimite**	$3\dot{L}a\,\ddot{C} + Ce^3\,(Fl,O)^3 + \dot{H}$	
594.	**Cerasine**	$Pb\,Cl + \dot{P}b\,\ddot{C}$	2

7. Oxalates.

595.	**Whewellite**	$\dot{C}a\,\ddot{E} + \dot{H}$	4
596.	**Oxalite**	$2\dot{F}e\,\ddot{E} + 3\dot{H}$	
597.	**Thierschite**	$\dot{C}a, \ddot{E}$	

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No.	Name.	Formula.	System of crystallization.
	E. RESINS AND ORGANIC COMPOUNDS.		
598.	**Amber** *	$C^{10} H^8 O$	
599.	**Copaline**	$C^{40} H^{32} O$	
600.	**Middletonite**	$C^{20} H^{16} + \dot{H}$	
601.	**Retinite** *		
602.	**Soleretinite**	$C^{10} H^7 O$	
603.	**Guyaquillite**	$C^{20} H^{18} O^6$	
604.	**Piauzite**		
605.	**Walchowite**	$C^{12} H^9 O$	
606.	**Bitumen** *	$C^3 H^5$	
607.	**Idrialite**	$C^{42} H^{14} O$	
608.	**Pyropissite**		
609.	**Brewstoline**	$\dot{C}$?	
610.	**Elaterite** *	C, H	
611.	**Scheererite**	C H^2 ?	4
612.	**Könlite**	$C^2 H$	
613.	**Fichtelite**	$C^4 H^3$	4
614.	**Könleinite**	$C^{36} H^{18}$	
615.	**Hartite**	$C^5 H^5$	4
616.	**Hartine**	$C^{20} H^{17} O^2$	3
617.	**Ixolyte**		
618.	**Hatchettine**	C, H	
619.	**Ozocerite**	C, H	
620.	**Chrismatine**		
621.	**Dopplerite.**	$C^9 H^5 O^5$	

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No.	Name.	Formula.	System of crystallization.
622.	Dinite		
623.	Hiroine		
624.	Jaulingite		
625.	Melanchyme		
626.	Anthracoxene		
627.	Baikerite		
628.	Krantzite		
629.	Mellite	$\dot{A}l\bar{M}^3 + 18\dot{H}$	2

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CHECK LIST OF MINERALS.

1. Gold *
2. Platinum *
3. Platiniridium *
4. Palladium
5. Quicksilver
6. Amalgam
7. Arquerite
8. Gold Amalgam *
9. Silver *
10. Bismuth Silver
11. Copper *
12. Lead
13. Iron
14. Tin
15. Zinc
16. Iridosmine *
17. Tellurium
18. Bismuth *
19. Tetradymite *
20. Antimony
21. Arsenic *
22. Arsenical Anti-
23. Sulphur * [mony *
24. Selenium
25. Selensulphur
26. Diamond *
27. Mineral Coal
    - 27a. Anthracite *
    - 27b. Bituminous
    - 27c. Jet * [Coal *
    - 27d. Lignite *
28. Graphite *
29. Realgar
30. Orpiment *
31. Dimorphine
32. Bismuthine *
33. Stibnite *
34. Discrasite
35. Domeykite *
36. Algodonite *
37. Whitneyite *
38. Silver Glance *
39. Erubescite *
40. Galena *
41. Steinmannite
42. Cuproplumbite ?
43. Alisonite
44. Manganblende
45. Syepoorite
46. Eisennickelkies
47. Clausthalite
48. Naumannite
49. Berzelianite
50. Eucairite
51. Hessite *
52. Altaite
53. Grünauite
54. Blende *
55. Copper Glance *
56. Akanthite
57. Stromeyerite
58. Cinnabar *
59. Millerite *
60. Pyrrhotine *
61. Greenockite
62. Wurtzite
63. Onofrite
64. Copper Nickel *
65. Breithauptite *
66. Kaneite
67. Schreibersite
68. Pyrites *
69. Hauerite
70. Smaltine *
71. Cobaltine
72. Gersdorffite *
73. Ullmannite
74. Marcasite *
75. Rammelsbergite
76. Leucopyrite *
77. Mispickel *
78. Glaucodot
79. Sylvanite *
80. Nagyagite
81. Covelline
82. Molybdenite *
83. Riolite
84. Skutterudite
85. Linnæite *
86. Cuban
87. Chalcopyrite *
88. Barnhardite *
89. Tin Pyrites
90. Sternbergite
91. Wolfsbergite
92. Tannenite
93. Berthierite
94. Zinkenite
95. Miargyrite

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96. Plagionite
97. Jamesonite
98. Heteromorphite
99. Brongniardite
100. Chiviatite
101. Dufrenoysite
102. Pyrargyrite
103. Proustite *
104. Freieslebenite *
105. Bournonite
106. Kenngottite
107. Boulangerite
108. Aikinite
109. Wölchite
110. Clayite?
111. Kobellite?
112. Meneghinite
113. Tetrahedrite *
114. Tennantite *
115. Geocronite *
116. Polybasite
117. Stephanite
118. Enargite *
119. Xanthocone
120. Fireblende
121. Wittichite
122. Calomel
123. Sylvine
124. Salt *
125. Sal Ammoniac
126. Kerargyrite
127. Embolite
128. Bromyrite
129. Iodo-bromid of
130. Fluor * [Silver
131. Yttrocerite *
132. Iodyrite
133. Coccinite
134. Fluocerite
135. Fluocerine
136. Cotunnite
137. Muriatic Acid
138. Cryolite
139. Chiolite
140. Fluellite
141. Carnallite
142. Tachhydrite
143. Periclase
144. Red Copper *
145. Martite *
146. Iserine
147. Irite?
148. Spinel *
149. Magnetite *
150. Magnoferrite
151. Franklinite *
152. Chromic Iron *
153. Pitchblende
154. Melaconite *
155. Plumbic Ochre *
156. Water *
157. Zincite *
158. Corundum *
159. Hematite *
160. Ilmenite *
161. Plattnerite
162. Tenorite
163. Braunite *
164. Hausmannite *
165. Cassiterite *
166. Rutile *
167. Anatase *
168. Chalcotrichite *
169. Chrysoberyl *
170. Brookite *
171. Pyrolusite *
172. Polianite
173. Minium *
174. Crednerite
175. Heteroclin
176. Palladinite? *
177. Voltzite
178. Matlockite
179. Mendipite
180. Percylite?
181. Karelinite?
182. Diaspore *
183. Göthite *
184. Manganite
185. Limonite *
186. Brucite *
187. Gibbsite *
188. Völknerite *
189. Hydrotalcite
190. Psilomelane *
191. Newkirkite
192. Wad *
193. Atacamite
194. Arsenolite *
195. Senarmontite
196. Valentinite
197. Bismuth Ochre *
198. Kermesite
199. Retzbanyite
200. Cervantite
201. Volgerite
202. Ammiolite
203. Sulphurous Acid
204. Telluric Ochre
205. Sulphuric Acid *
206. Wolframine *
207. Molybdine *
208. Carbonic Acid *
209. Sassolin
210. Quartz *
  210a. Jasper *
  210b. Agate *
  210c. Chalcedony *
211. Opal *
  211a. Precious opal
  211b. Semi-opal *
  211c. Hyalite
  211d. Geyserite
212. Edelforsite
213. Wollastonite *
214. Pyroxene
  214a. Diopside *
  214b. Hedenbergite *
  214c. Augite *
215. Pelicanite
216. Spodumene *
217. Prehnitoid
218. Amphibole
  218a. Tremolite *
  218b. Actinolite *
  218c. Hornblende *
219. Acmite
220. Strakonitzite?

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221. Enstatite
222. Anthophyllite *
223. Hypersthene *
224. Wichtyne
225. Babingtonite *
226. Rhodonite *
227. Beryl *
228. Eudialyte
229. Eulytine
230. Leucophane
231. Melinophane
232. Peridot
  232a. Forsterite *
  232b. Chrysolite *
  232c. Fayalite *
233. Tephroite *
234. Knebelite
235. Chondrodite *
336. Willemite *
237. Phenacite *
238. Garnet
  238a. Pyrope *
  238b. Grossular *
  238c. Almandine *
  238d. Spessartine *
  238e. Melanite *
  238f. Ouvarovite
239. Helvin
240. Zircon *
241. Auerbachite
242. Alvite ?
243. Tachyaphaltite
244. Idocrase *
245. Sarcolite
246. Meionite
247. Scapolite *
248. Mellilite
249. Dipyre
250. Epidote
  250a. Pistacite *
  250b. Zoisite *
  250c. Piedmontite
251. Allanite *
252. Partschin
253. Zoisite *Brooke*
254. Gadolinite
255. Danburite †
256. Axinite *
257. Iolite *
258. Muscovite *
259. Phlogopite *
260. Biotite *
261. Astrophyllite
262. Lepidomelane
263. Lepidolite *
264. Sodalite *
265. Lapis Lazuli
266. Häuyne
267. Nosean
268. Skolopsite
269. Leucite
270. Nepheline *
271. Cancrinite *
272. Anorthite
273. Andesine *
274. Barsowite
275. Bytownite ?
276. Labradorite *
277. Oligoclase *
278. Albite *
279. Orthoclase *
280. Petalite *
281. Cyclopite
282. Weissigite ?
283. Pollux
284. Isopyre
285. Silicate of Yttria?
286. Polychroilite
287. Gehlenite
288. Andalusite *
289. Topaz *
290. Staurotide *
291. Carolathine
292. Lievrite *
293. Kyanite *
294. Sillimanite *
295. Sapphirine
296. Euclase
297. Sphene *
298. Keilhauite
299. Tourmaline *
300. Talc *
301. Meerschaum
302. Neolite
303. Spadaite
304. Chlorophæite
305. Crocidolite
306. Picrophyll
307. Kerolite *
308. Monradite
309. Aphrodite
310. Picrosmine
311. Saponite *
312. Serpentine *
313. Deweylite *
314. Hydrophite *
315. Nickel Gymnite *
316. Ottrelite *
317. Groppite
318. Stilpnomelane
319. Chalcodite †
320. Eukamptite
321. Melanhydrite
322. Hisingerite
323. Thuringite *
324. Euphyllite †
325. Pyrosclerite *
326. Pseudophite ?
327. Thermophyllite?
328. Chlorite
  328a. Chlorite
  328b. Pennine
  328c. Clinochlore
329. Delessite
330. Ripidolite *G. Rose*
331. Clintonite *
332. Chloritoid *
333. Cronstedtite
334. Sideroschisolite
335. Margarite *
336. Ephesite
337. Pyrophyllite *
338. Pholerite *
339. Anthosiderite
340. Apophyllite *
341. Pectolite *
342. Okenite
343. Laumontite *

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344. Leonhardite *
345. Cataplelite
346. Dioptase
347. Chrysocolla *
348. Demidoffite
349. Pyrosmalite
350. Portite
351. Tritomite
352. Thorite
353. Cerite
354. Calamine *
355. Prehnite *
356. Chlorastrolite †
357. Savite
358. Schneiderite
359. Carpholite
360. Analcime *
361. Ittnerite
362. Faujasite
363. Chabazite *
364. Gmelinite
365. Levyne
366. Gismondine
367. Edingtonite
368. Harmotome
369. Phillipsite
370. Thomsonite *
371. Natrolite *
372. Scolecite
373. Ellagite
374. Sloanite
375. Epistilbite
376. Heulandite *
377. Brewsterite
378. Stilbite *
379. Caporcianite
380. Datholite *
381. Allophane *
382. Schrötterite *
383. Chloropal
384. Collyrite
385. Wolchonskoite
386. Chrome Ochre
387. Pimelite
388. Montmorillonite
389. Delanovite ?
390. Erdmanite
391. Bavalite
392. Tscheffkinite
393. Schorlomite †
394. Mosandrite
395. Wölherite
396. Turnerite ?
397. Perofskite
398. Pyrochlore *
399. Pyrrhite
400. Scheelite *
401. Scheeletine
402. Tungstate of Cop-
403. Wulfenite * [per †
404. Azorite
405. Fergusonite
406. Tyrite ?
407. Adelpholite
408. Tantalite
409. Wolfram *
410. Columbite *
411. Paracolumbite ? †
412. Samarskite *
413. Mengite
414. Polymignyte *
415. Polycrase
416. Æschynite
417. Euxenite
418. Yttro-Tantalite
419. Parathorite †
420. Rutherfordite †
421. Crocoisite
422. Vauquelinite *
423. Melanochroite
424. Dechenite
425. Descloizite
426. Vanadinite
427. Volborthite
428. Pateraite ?
429. Glaserite
430. Thenardite
431. Barytes *
432. Celestine *
433. Anhydrite *
434. Anglesite *
435. Almagrerite
436. Leadhillite *
437. Caledonite *
438. Dreelite
439. Susannite
440. Glauberite
441. Lanarkite
442. Reussin
443. Selenate of Lead
444. Connellite
445. Alumian
446. Misenite
447. Polyhalite
448. Gypsum *
449. Astrakanite
450. Löweite
451. Mascagnine
452. Lecontite
453. Coquimbite
454. Rœmerite
455. Cyanosite *
456. Cyanochrome
457. Picromerid
458. Alunogen *
459. Alum
459a. Potash Alum*
459b. Solfatarite
459c. Tschermigite
459d. Pickeringite
459e. Halotrichite*
459f. Apjohnite *
460. Voltaite
461. Epsomite *
462. Tauriscite ?
463. Mangan Vitriol
464. Goslarite
465. Copperas *
466. Bieberite
467. Pyromeline *
468. Morenosite
469. Johannite [Uran.
470. Bas. Sulph. of
471. Glauber Salt *
472. Botryogen
473. Coplapite
474. Apatelite
475. Alunite *

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476. Jarosite
477. Websterite
478. Loewigite
479. Pissophane
480. Linarite
481. Brochantite
482. Lettsomite
483. Medjidite
484. Uranochre
485. Uranochalcite
486. Boracite
487. Rhodizite
488. Hydroboracite
489. Hayesine
490. Borocalcite
491. Borax
492. Lagonite
493. Larderellite
494. Warwickite †
495. Apatite *
496. Hydroapatite
497. Cryptolite
498. Pyromorphite *
499. Mimetene *
500. Xenotime *
501. Monazite *
502. Wagnerite
503. Kühnite
504. Lazulite *
505. Turquois *
506. Conarite ?
507. Triphyline *
508. Triplite
509. Fischerite
510. Hopeite
511. Amblygonite *
512. Herderite
513. Carminite
514. Romeine
515. Thrombolite
516. Stercorite
517. Struvite
518. Haidingerite
519. Pharmacolite
520. Vivianite *
521. Erythrine *
522. Hörnesite
523. Roesslerite
524. Annabergite *
525. Köttigite
526. Symplesite
527. Trichalcite
528. Scorodite *
529. Libethenite
530. Olivenite
531. Conichalcite
532. Euchroite
533. Arseniosiderite
534. Pharmacosiderite
535. Wavellite *
536. Cacoxene *
537. Childrenite *
538. Erinite
539. Cornwallite
540. Phosphochalcite *
541. Tagilite
542. Tyrolite
543. Delvauxene
544. Dufrenite *
545. Aphanesite
546. Chalcophyllite
547. Liroconite
548. Uranite *
549. Chalcolite
550. Carphosiderite
551. Plumbo Resinite
552. Calcoferrite
553. Pittieite *Haus* *
554. Diadochite
555. Lindackerite ?
556. Nitrammite *
557. Nitre *
558. Nitratine
559. Nitrocalcite *
560. Calcite *
561. Magnesite *
562. Dolomite *
563. Breunnerite
564. Chalybite *
565. Diallogite *
566. Smithsonite *
567. Aragonite *
568. Witherite
569. Strontianite *
570. Bromlite
571. Manganocalcite
572. Cerusite *
573. Barytocalcite
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SMITHSONIAN MISCELLANEOUS COLLECTIONS.
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A

DICTIONARY

OF THE

CHINOOK JARGON,

OR

TRADE LANGUAGE OF OREGON.

PREPARED FOR THE SMITHSONIAN INSTITUTION.

BY

GEORGE GIBBS.

WASHINGTON:
SMITHSONIAN INSTITUTION:
MARCH, 1863.

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ADVERTISEMENT.

In 1855, the Smithsonian Institution published a Vocabulary of the Jargon or Trade Language of Oregon, from a manuscript furnished by Dr. B. Rush Mitchell, and edited by Prof. W. W. Turner. This was necessarily very imperfect, and in fact was printed mainly with the view of eliciting additions and corrections, which might be used to prepare a more perfect account of this very remarkable mixture of language. The present work, which is much more complete, has been prepared by George Gibbs, Esq., from materials collected by himself during a residence of twelve years on the northwest coast of North America.

JOSEPH HENRY.

Washington, 1863.

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PREFACE.

Some years ago the Smithsonian Institution printed a small vocabulary of the Chinook Jargon, furnished by Dr. B. R. Mitchell, of the U. S. Navy, and prepared, as I afterwards learned, by Mr. Lionnet, a Catholic priest, for his own use while studying the language at Chinook Point. It was submitted by the Institution, for revision and preparation for the press, to the late Professor W. W. Turner. Although it received the critical examination of that distinguished philologist, and was of use in directing attention to the language, it was deficient in the number of words in use, contained many which did not properly belong to the Jargon, and did not give the sources from which the words were derived.

Mr. Hale had previously given a vocabulary and account of this Jargon in his "Ethnography of the United States Exploring Expedition," which was noticed by Mr. Gallatin in the Transactions of the American Ethnological Society, vol. ii. He, however, fell into some errors in his derivation of the words, chiefly from ignoring the Chihalis element of the Jargon, and the number of words given by him amounted only to about two hundred and fifty.

A copy of Mr. Lionnet's vocabulary having been sent to me, with a request to make such corrections as it might require, I concluded not merely to collate the words contained in this and other printed and manuscript vocabularies, but to ascertain, so far as possible, the languages which had contributed to it, with the original Indian words. This had become the more important, as its extended use by different tribes had led to ethnological errors in the classing together of essentially distinct families. Dr. Scouler, whose vocabularies were among the earliest bases of comparison of the languages of the northwest coast, assumed a number of words, which he found indiscriminately

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employed by the Nootkans of Vancouver Island, the Chinooks of the Columbia, and the intermediate tribes, to belong alike to their several languages, and exhibit analogies between them accordingly.* On this idea, among other points of fancied resemblance, he founded his family of Nootka-Columbians,—one which has been adopted by Drs. Pritchard and Latham, and has caused very great misconception. Not only are those languages entirely distinct, but the Nootkans differ greatly in physical and mental characteristics from the latter. The analogies between the Chinook and the other native contributors to the Jargon are given hereafter.

The origin of this Jargon, a conventional language similar to the Lingua Franca of the Mediterranean, the Negro-English-Dutch of Surinam, the Pigeon English of China, and several other mixed tongues, dates back to the fur droguers of the last century. Those mariners whose enterprise in the fifteen years preceding 1800, explored the intricacies of the northwest coast of America, picked up at their general rendezvous, Nootka Sound, various native words useful in barter, and thence transplanted them, with additions from the English, to the shores of Oregon. Even before their day, the coasting trade and warlike expeditions of the northern tribes, themselves a seafaring race, had opened up a partial understanding of each other's speech; for when, in 1792, Vancouver's officers visited Gray's Harbor, they found that the natives, though speaking a different language, understood many words of the Nootka.

On the arrival of Lewis and Clarke at the mouth of the Columbia, in 1806, the new language, from the sentences given by them, had evidently attained some form. It was with the arrival of Astor's party, however, that the Jargon received its principal impulse. Many more words of English were then brought in, and for the first time the French, or rather the Canadian and Missouri patois of the French, was introduced. The principal seat of the company being at Astoria, not only a large addition of Chinook words was made, but a considerable number was taken from the Chihalis, who immediately bordered that tribe on the north,—each owning a portion of Shoalwater Bay. The words adopted from the several languages were, naturally enough, those most easily uttered by all, except, of course, that objects new to the natives found their names in French or English, and such modifications were made in pronunciation as suited tongues accustomed to different sounds. Thus the gutturals of the

* Journal Royal Geographical Society of London, vol. xi., 1841.

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Indians were softened or dropped; and the *f* and *r* of the English and French, to them unpronounceable, were modified into *p* and *l*. Grammatical forms were reduced to their simplest expression, and variations in mood and tense conveyed only by adverbs or by the context. The language continued to receive additions, and assumed a more distinct and settled meaning, under the Northwest and Hudson's Bay companies, who succeeded Astor's party, as well as through the American settlers in Oregon. Its advantage was soon perceived by the Indians, and the Jargon became to some extent a means of communication between natives of different speech, as well as between them and the whites. It was even used as such between Americans and Canadians. It was at first most in vogue upon the lower Columbia and the Willamette, whence it spread to Puget Sound, and with the extension of trade, found its way far up the coast, as well as the Columbia and Fraser rivers; and there are now few tribes between the 42d and 57th parallels of latitude in which there are not to be found interpreters through its medium. Its prevalence and easy acquisition, while of vast convenience to traders and settlers, has tended greatly to hinder the acquirement of the original Indian languages; so much so, that except by a few missionaries and pioneers, hardly one of them is spoken or understood by white men in all Oregon and Washington Territory. Notwithstanding its apparent poverty in number of words, and the absence of grammatical forms, it possesses much more flexibility and power of expression than might be imagined, and really serves almost every purpose of ordinary intercourse.

The number of words constituting the Jargon proper has been variously stated. Many formerly employed have become in great measure obsolete, while others have been locally introduced. Thus, at the Dalles of the Columbia, various terms are common which would not be intelligible at Astoria or on Puget Sound. In making the following selection, I have included all those which, on reference to a number of vocabularies, I have found current at any of these places, rejecting, on the other hand, such as individuals, partially acquainted with the native languages, have employed for their own convenience. The total number falls a little short of five hundred words.

An analysis of their derivations gives the following result:

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I had no opportunity of original investigation into the Nootka proper, but from the few words in different published vocabularies, and from some imperfect manuscript ones in my possession of the Tokwaht, Nittinat, and Makah dialects, have ascertained the number above given. Some of the unascertained words probably also belong to that language. Neither was I able to collate the Wasco or Kalapuya, but have assigned them on the opinion of others. The former, also called Cathlasco, the dialect of the Dalles Indians, is a corrupted form of the Watlala or Upper Chinook. With the Chihalis, Yakama, and Klikatat, and the Nisqually, I had abundant means of comparison.

The introduction of the Cree and Chippeway words is of course due to the Canadians. None have been derived from the Spanish, as their intercourse with the Nootka and Makah Indians was too short to leave an impression. Spanish words, especially those relating to horses or mules and their equipments, have of late come into general use in Oregon, owing to intercourse with California, but they form no part of the Jargon. It might have been expected from the number of Sandwich Islanders introduced by the Hudson's Bay company, and long resident in the country, that the Kanaka element would have found its way into the language, but their utterance is so foreign to the Indian ear, that not a word has been adopted.

In the nouns derived from the French, the definite article *le*, *la*, has almost in every instance been incorporated into the word, and the same has in one or two instances been prefixed to nouns not of French origin. Besides the words created by direct onomatopœia, there are quite a number which are really Indian, but have their origin in the similarity of sound to sense.

Dr. Scouler's analogy between the Nootkan and "Columbian," or Chinook, was founded on the following words:

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English.	*Tlaequatch and Nutka.*	*Columbian.*
plenty,	*aya,	*haya.
no,	*wik,	*wake.
water,	tchaak,	chuck.
good,	*hooleish,	*closh.
bad,	*peishakeia,	*peshak.
man,	*tchuckoop,	tillichass.
woman,	*tlootseemin,	*clootchamen.
child,	*tanassia,	*tanass.
now,	tlahowieh,	clahowiah.
come,	*tchooqua,	*sacko.
slave,	mischemas,	*mischemas.
what are you doing,	*akoots-ka-*mamook,	ekta-*mammok.
what are you saying,	*au-kaak-*wawa,	ekta-*wawa.
let me see,	*nannanitch,	*nannanitch.
sun,	*opeth,	ootlach.
sky,	*sieya,	*saya.
fruit,	*chamas,	*camas.
to sell,	*makok,	*makok.
understand,	*commatax,	*commatax.

But of these, none marked with an asterisk belong to the Chinook or any of its dialects. The greater part of them are undoubtedly Nootkan, though there are errors in the spelling and, in some instances, in the meaning. Of the rest, the Nootkan *tchaak* and the Chinook *tl'tsuk* alone presents an analogy. *Klahowiah* does not mean "now," nor do I believe it is Nootkan, in any sense. It is, as explained in the dictionary, the Chinook salutation, "How do you," "Good-bye," and is supposed to be derived from the word for *poor, miserable. Mischemas* is not Chinook, and is probably not Nootkan. With the exception of Franchere, whose short vocabulary was published by Mr. Gallatin, and Mr. Hale, all the writers mentioned by Ludwig who have given specimens of the Chinook language, have presented it in its Jargon form, more or less mixed with the neighboring ones, and with corruptions of French and English words. Mr Swan, among others, has been led into this error. The place of his residence, Shoalwater Bay, is common ground of the Chinook and Chihalis Indians, and the degraded remnants of the two tribes are closely intermarried, and use both languages almost indifferently.

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Setting aside interjections, common in a more or less modified form to several adjoining tribes, twenty-one words of those given in this vocabulary present noticeable analogies between the Chinook and other native languages. They are as follows:

English.	*Chinook.*	*Hailtsuk and Bellella.*
salmon berries,	klalilli,	olalli.

English.	*Chinook and Clatsop.*	*Nootka.* Jewitt and Cook.
water,	tl'tsuk : tl'chukw,	chauk : chahak.

English.	*Chinook.*	*Cowlitz.*	*Kwantlen.*	*Selish.*
six,	tákhum,	tukh'um,	tuckhum',	táckan.

English.	*Chinook.*	*Chihalis.*	*Nisqually.*
deep,	kellippe,	kluputl,	klep.
glad,	kwan,		kwal (*tame*).
proud,	eyútl,		júil.
demon,	ichiatku,	tsiatko,	tsiatko.
black bear,	eitchhut,		chetwut.
crow,	akaka,		akaka.
oyster,	klokhklokh,	chetlókh,	klokhklokh.
game of "hands,"	itlokum,	setlokum.	

English.	*Chinook.*	*Yakama and Klikatat.*
certainly,	nawitka,	n'witka.
always,	kwanisum,	kwálisim.
younger sister,	ats,	atse.
road,	wehut,	wiet (*far*).
barrel,	tamúlitah,	tamolitsh.
buffalo,	emúsmus,	músmus.
coyote,	itálipus,	telipa (*gray fox*)
mouse,	kholkhol,	khóilkhoil.
bread,	tsapelil,	saplil.
needle,	okwépowa,	kapus (*a pin*).

The Clatsop (Klátsop) is merely a dialect of the Chinook (Tchinúk); the Cowlitz (Káualitsk), Kwantlen, Chihalis (Tsihélis), and Nisqually (N'skwáli), are severally languages belonging to the Sélish family. The Yakama and Klikatat are dialects of one of the

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Sahaptin languages; and the Tokwaht (Tokwát), Nittinat, and Makah (Maká) quoted in the dictionary, are dialects of the Nootka (Nútka), of which the Hailtzuk or Belbella (variously spelled Haeeltzuk and Hailtsa) is probably the northern type. It thus appears that, with two or three exceptions, the analogies of the Chinook, as contained in this vocabulary, are to be sought in the immediately adjoining tongues, or those of languages belonging to the same families with them; that these analogies, with perhaps one or two exceptions, can by no means be considered radical, and that their correspondence, or rather adoption, is easily accounted for by neighborhood and habits of intermarriage. A much more remarkable coincidence is the fact that two words included in this Jargon,—one from the Nootkan, viz., *Mawitch*, a deer, venison; and the other Chinook, *Mooluk*, an elk,—are also to be found in the Kowilth, the language of Humboldt Bay, in California. As this bay was first discovered in the winter of 1849–50, the words could not have been introduced by the fur trappers.

With regard to the form into which this dictionary has been thrown, an explanation is necessary. The Jargon must in some degree be regarded as a written language, the orthography of which is English. In Mr. Hale's vocabulary alone has one more scientific been attempted, and of several other printed, and numerous manuscript dictionaries in circulation, M. Lionnet's alone, that I have met with, is according to the French. Although no fixed system of spelling exists among them, I have therefore deemed it best to preserve for the Jargon words that which most distinctly represents the common English pronunciation; while for the Indian derivations, I have adopted that recommended by the Smithsonian Institution in collecting Indian vocabularies, using the Italian sounds of the vowels, and representing the guttural of the German *ich* by *kh*. This seemed the more proper, as the work would thereby be rendered of practical use, independent of what philological value it may possess.

In collating the words of the present work and obtaining their derivations, I have been assisted by a number of friends; among whom I should specially mention Mr. Alexander C. Anderson, of Victoria, V. I., and Mr. Solomon H. Smith, of Clatsop, Oregon.

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Bibliography of the Chinook Jargon.

Journal of Travels over the Rocky Mountains. By Rev. Samuel Parker. 12mo. Ithaca, N. Y., 1838.

"Vocabulary of the Chenook language, as spoken about Fort Vancouver," pp. 336–338.

Ethnography and Philology of the United States Exploring Expedition. By Horatio Hale. 4to. Philadelphia: Lea & Blanchard, 1846.

A vocabulary of the "Jargon or Trade Language of Oregon," with an essay thereon, and phrases, is given in this work, pp. 636–650.

Transactions of the American Ethnological Society. 2 vols., 8vo. New York: Bartlett & Welford, 1845, 1848.

In vol. ii., pp. 62–70, under title of "Hale's Indians of Northwest America," is a partial reprint of the above.

Rev. Z. B. Z. Bolduc, "*Mission de la Colombie.*" 8vo. Quebec, 1843.

The Lord's Prayer in Jargon, "et quelques mots Tchinouks et Sneomus." The Snohomish is a tribe of Puget Sound. The Chinook words are merely Jargon.

Journal of Travels over the Rocky Mountains, &c. By Joel Palmer. 12mo. Cincinnati, 1847, 1852.

"Words used in the Chinook Jargon," pp. 147–152.

Adventures of the First Settlers on the Oregon or Columbia River, &c. By Alexander Ross. 12mo. London, 1849.

Ross gives a "Chinook Vocabulary," pp. 342–348, and words of the "mixed dialect," p. 349. His Chinook is, however, also impure.

Ten Years in Oregon. By D. Lee and F. H. Frost. 12mo. New York, 1844.

"A short vocabulary of the Clatsop dialect." This is likewise Jargon.

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History, &c., of the Indian Tribes of the United States. Collected by Henry R. Schoolcraft. 4to. Parts 1–5. Philadelphia, 1851, 1855.

Lieut. G. F. Emmons gives a brief "Klatsop Vocabulary" in Part III., pp. 223, 224, which is of the same character.

Note 1 to article, "Philosophy of Utterance," Part V., pp. 548–551, a "Vocabulary of the Chinook Jargon."

Vocabulary of the Jargon or Trade Language of Oregon. English, French, and Jargon. 8vo. Washington, 1853. pp. 22.

Printed by the Smithsonian Institution, for private distribution. Without title-page. This is the one by M. Lionnet, before referred to.

The Northwest Coast; or, Three Years' Residence in Washington Territory. By James G. Swan. 12mo. New York: Harpers, 1857.

"A vocabulary of the Chehalis and Chenook or Jargon Languages, with the derivation of the words used in the latter," pp. 412–422.

A Complete Dictionary of the Chinook Jargon. English—Chinook, and Chinook—English. To which is added numerous conversations, &c. 3d edition. 24mo, pp. 24. Portland, Oregon: published by S. J. McCormick.

Several editions of this work have been published; the last which I have seen, in 1862.

Guide-Book to the Gold Regions of Frazer River. With a map of the different routes, &c. 24mo, pp. 55. New York, 1858.

A vocabulary of the Jargon, pp. 45–55.

The Chinook Jargon and English and French Equivalent Forms. In "Steamer Bulletin," San Francisco, June 21, 1858.

Contains an unarranged vocabulary of 354 words and phrases.

The Canoe and the Saddle. By Theodore Winthrop. 12mo. Boston: Ticknor & Fields. 1863.

"A partial vocabulary of the Chinook Jargon," pp. 299–302.

History of the Oregon Territory, &c. By John Dunn. 2d edition. London, 1846.

"A few specimens of the language of the Millbank and Chinook tribes." *Chinook tribe:* 50 words and phrases, including digits. These words, as usual, are in great part "Jargon," and belong to the Nootkan, *not* to the Chinook.

Besides the above, one, of which I have not the title before me, has been published by Mr. A. C. Anderson, and several in the newspapers of Oregon and Washington Territory.

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PART I.

CHINOOK-ENGLISH.

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Norn.—The references, "Hale," "Cook," "Jewitt," are respectively to Hale's "Ethnology of the United States Exploring Expedition," "Cook's Voyages," and "Jewitt's Narrative." The others, as "Anderson," "Pandosy," "Shaw," "Tolmie," are from manuscript notes of those gentlemen in possession of the writer.

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A DICTIONARY

OF THE

CHINOOK JARGON.

PART I. CHINOOK—ENGLISH.

A.

Ah-ha, *adv.* Common to various tribes. *Yes.* Expression of simple assent. On Puget Sound, E-ÉH.

Ah'n-kut-te, or **Ahn-kot-tie**, *adv.* Chinook, ANKUTTI. *Formerly; before now.* With the accent prolonged on the first syllable, *a long time ago.* Ex. Ahnkutte lakit sun, *four days ago;* Tenas ahnkutte, *a little while since.*

Al-áh, *interj.* Expression of surprise. Ex. Alah mika chahko! *ah, you've come!*

Al-kie, *adv.* Chinook, ALKEKH. *Presently; in a little while; hold on; not so fast.*

Al'-ta, *adv.* Chinook, ALTAKH. *Now; at the present time.*

A-mo'-te, *n.* Chinook, AMUTE; Clatsop, KLABOTÉ. *The strawberry.*

An-áh, *interj.* An exclamation denoting pain, displeasure, or depreciation. Ex. Anah nawitka mika halo shem, *ah, indeed you are without shame.* On Puget Sound, Ad-de-dáh.

Ats, *n.* Chinook, idem; Yakama, ATSE (Pandosy). *A sister younger than the speaker.* In the original, only when used by her brother.

A-yáh-whul, *v.* Chihalis, AYAHWUL. *To lend; borrow.*

Ay-kéh-nam. See EH-KAH-NAM.

B.

Bé-be, *n., v.* French. A word used towards children; probably a repetition of the first syllable of BAISER. *A kiss; to kiss.*

Bed, *n.* English, idem. *A bed.*

Bit, or **Mit**, *n.* English, BIT. *A dime or shilling.*

Bloom, *n.* English, BROOM. *A broom.* Mamook bloom, *to sweep.*

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Boat, *n.* English, idem. *A boat,* as distinguished from a canoe.

Bos'-ton, *n., adj.* *An American; American.* A name derived from the hailing-place of the first trading-ships to the Pacific. Boston illahie, *the United States.*

Bur-dash, *n.* Can. French, BERDACHE (Anderson). *An hermaphrodite.* The reputation of hermaphroditism is not uncommon with Indians, and seems to attach to every malformation of the organs of generation. The word is of very limited use.

C.

Cal'-li-peen, *n.* French, CARABINE. *A rifle.*

Ca-nim, *n.* Chinook, EKANIM. *A canoe.* Canim stick, *the cedar, or wood from which canoes are usually made.*

Ca-po', *n.* French, CAPOT. *A coat.*

Chah'-ko, *v.* Nootka, Clayoquot, CHAKO; Tokwaht, TCHOKWA. *To come; to become.* Ex. Kansih mika chahko? *when did you come?* Chahko kloshe, *to get well.*

Chák-chak, *n.* Chinook, idem. *The bald eagle* (by onoma.), from its scream. Of only local use on the lower Columbia.

Chee, *adv., adj.* Chinook, T'SHI. *Lately; just now; new.* Chee nika ko, *I have just arrived.* Hyas chee, *entirely new.*

Chet'-lo, or **Jet'-lo,** *n.* Chihalis, CHETLOKH. *An oyster.* Used on the lower Columbia.

Chet-woot, *n.* Nisqually, idem. *A black bear.* Used only on Puget Sound.

Chik'-a-min, *n., adj.* Tokwaht, TSIKAMEN; Nootka, SICKAMINNY (Jewitt); SEEKEMAILE (Cook). *Iron; metal; metallic.* T'kope chikamin, *silver;* pil chikamin, *gold* or *copper.* Chikamin lope, *wire; a chain.*

Chik-chik. See TSIK-TSIK.

Chil-chil. See TSIL-TSIL.

Chitsh, *n.* Chihalis, TSHITSH. *A grandmother.*

Chope, *n.* Chihalis, TSHUP. *A grandfather.*

Cho'-tub, *n.* Nisqually, idem. *A flea.* Used on Puget Sound.

Chuck, *n.* Nootka, CHAUK (Cook); CHAHAK, *fresh water* (Jewitt); Chinook, TLTSUK (Shortess); Clatsop, TL'CHUKW. *Water; a river or stream.* Salt chuck, *the sea;* skookum chuck, *a rapid;* solleks chuck, *a rough sea;* chuck chahko *or* kalipi, *the tide rises* or *falls;* saghilli *and* keekwillie chuck, *high* and *low tide.*

Chuk-kin, *n., v.* Chihalis, TSUKAEN. *To kick.* Of local use only.

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Close. See KLOSE.

Cly, *v.* English. *To cry.*

Cole, *adj.* English, COLD. Cole illahie, *winter;* icht cole, *a year*, cole sick waum sick, *the fever and ague.*

Comb, *n.* English. *A comb.* Mamook comb, *to comb;* mamook comb illahie, *to harrow.*

Coo'-ley, *v.* French, COUREZ, imp. of COURIR. *To run.* Cooley kiuatan, *a race-horse;* yahka hyas kumtuks cooley, *he can*, i. e., *knows how to run well.*

Coop'-coop, *n.* Chinook, idem. *The smaller sized dentalium or shell money.* See HYKWA.

Co'-sho, *n.* French, COCHON. *A hog; pork.* Siwash cosho, *a seal;* literally, *Indian pig.*

Cul'-tus, *adj.* Chinook, KALTAS. *Worthless; good for nothing; without purpose.* Ex. Cultus man, *a worthless fellow;* cultus potlatch, *a present or free gift;* cultus heehee, *a jest; merely laughing;* cultus nannitsh, *to look around;* cultus mitlite, *to sit idle; to do nothing;* cultus klatawa, *to stroll. Ques.* What do you want? *Ans.* Cultus, i. e., *nothing.*

D.

De-láte, or **De-létt**, *adj., adv.* French, DROITE. *Straight; direct; without equivocation.* Ex. Klatawa delett, *go straight;* delett wauwau, *tell the truth.*

Di-áub, or **Yaub**, *n.* French, DIABLE. *The devil.* Sometimes used combined with the article, as LEJAUB.

D'ly, or **De-ly**, *adj.* English, DRY. Chahko dely, *to become dry;* mamook dely, *to dry, v. a.*

Doo'-tin, *n.* English. *A doctor.*

Dol'-la, or **Táh-la**, *n.* English. *A dollar; money.* Chikamin dolla, *silver;* pil dolla, *gold;* dolla siághost, *spectacles.*

E.

Eh-káh-nam, *n.* Chinook, EKANAM. *A tale or story.* Used only on the Columbia river. Often erroneously pronounced Ay-keh-nam.

Eh-ko-li, *n.* Chinook, ÉKOLI. *A whale.*

Ee'-na, *n.* Chinook, INA. *A beaver.* Eena stick (literally, *beaver wood*), *the willow.*

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Ee'-na-poo, or **In-a-poo**, *n.* Chinook, INAPU. *A louse.* Sopen inapoo, *a flea.*

Ek'-keh, *n.* Chinook, EKKE. *A brother-in-law.*

E'-la-han, or **E-lánn**, *n.* Chihalis, YÈLAÀN. *Aid; assistance; alms.* Mamook elann, *to help.*

E'-lip, or **El'-ip**, *adv.* Chihalis, ILIP. *First; before.* The superlative. Klatawa elip, *go before;* elip lolo chuck, *in the first place carry water;* elip kloshe, *best;* elip tilikum, *n.* (literally, *the first people*), *a race of beings who inhabited the world before the Indians.*

E-li'-te, *n.* Chinook, ILAITEKH. *A slave.*

E-sált'h, or **Ye-sált'h**, *n.* Probably Wasco. *Indian corn or maize.*

G.

Get-up, or **Ket-op**, *v.* English. *To get up; rise.*

Glease, *n.* English, GREASE. *Fat, grease, or oil.* Hyeu glease, *very fat;* too-toosh glease, *butter.* See, also, LAKLES.

H.

Háh-lakl, *adj.* Chinook, HÀLAKL. *Wide; open.* Ex. Mamook hahlakl la pote, *open the door;* chahko hahlakl (as of the woods), *to open out; become less dense.*

Háht-haht, *n.* Nisqually, HATHAT. *The mallard duck.*

Hák-at-shum, *n.* English. *A handkerchief.*

Ha'-lo, *adj.* Quære u. d. not Chinook. *None; absent.* *Q.* Halo salmon mika? *have you no fish?* *A.* Halo, *none.* *Q.* Kah mika papa? *where is your father?* *A.* Halo, *he is out.* Halo wind, *breathless; dead;* halo glease, *lean;* halo ikta, *poor; destitute.*

Haul, *v.* English, idem. *To haul or pull.* Used with the active verb mamook; as, mamook haul.

Hee'-hee, *n.* By onoma., HIHI (Hale). *Laughter, amusement.* Cultus heehee, *fun;* mamook heehee, *to amuse;* heehee house, *any place of amusement*, as a tavern, bowling-alley, &c.

Hóh-hoh, *n., v.* Chinook (by onoma.), HOKHHOKH. *To cough.*

Hó-ku-melh, *v.* Chihalis, idem. *To gather; to glean*, as grain. Of local use.

Hóol-hool, *n.* Chinook, KHOLKHOL; Klikatat. KHOILKHOIL. *A mouse.* Hyas hoolhool, *a rat.*

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House, *n.* English. *A house.* Mahkook house, *a store;* Boston house, *an American-built house*, as distinguished from a lodge.

Howh, *interj.* Haukh. *Turn to; hurry.*

How'-kwutl, *adv.* Chinook, Haukatlh. An expression of inability. Ex. Howkwutl nika klatawa? *how could I go?*

Hul-lel', *v. n.* Chinook, idem. *To shake.* Used with the verb mamook, as, mamook hullel, it becomes active.

Hul-ó-i-ma, *n., adj.* Chinook, S'hulloyiba. *Other; another; different.* Ex. Huloima tilikum, *a different tribe or people;* hyas huloima, *very different.*

Humm, *n., v.* Jargon. *A stink or smell; to stink.* An invented word. Humm opootsh, *a skunk.*

Hunl'-kih, *adj.* Chinook, Hunlkekh. *Curled or curly; knotted; crooked.*

Huy-huy, *n., v.* Canadian French, Hui-hui. *A bargain or exchange; to barter or trade.* Ex. Huyhuy la sille, *change the saddle;* huyhuy tumtum, *to change one's mind.* Mr. Anderson says this is a cant word of the Canadians, signifying a hasty exchange. Its origin has been suggested in *oui oui*, yes yes.

Hwah, or **Hwah-wa**, *interj.* Denotes surprise or admiration; also earnestness.

Hy'-ak, *adv.*, also used as imperative. Chinook, Ai-ak. *Swift; fast; quickly; hurry; make haste.*

Hy-as', *adj., adv.* Probably corrupted from the following. *Large; great; very.* The general term for size. Hyas tyee, *a great chief;* hyas mahcook, *a great price; dear;* hyas ahnkutte, *a long time ago;* hyas kloshe, *very good.*

Hy-iú, *n., adj.* Nootka, Iyahish (Jewitt); Tokwaht, Aiya. Jewitt also gives Hyo as the name for *ten. Much; many; plenty; enough.* Term of quantity or multitude. Hyiu tilikum, *a crowd; many people;* hyiu muckamuck, *plenty to eat;* tenas hyiu, *some; a few;* wake hyiu, *not many* or *not much.*

Hy'-kwa, or **Hy'-a-kwa**, *n.* Nootka, Haihwa (i-whaw, Jewitt). *The dentalium; the shell money or wampum of the Pacific coast.* It is used in strings of a fathom long; shells of not more than forty to the fathom being of full size, and the value increasing in proportion to their length. The smaller sizes are called *coop-coop* (q. v.). These shells were formerly obtained by the Indians of the west coast of Vancouver Island, and passed in barter as low down as California, and eastward to the Blackfoot country.

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I.

Ik'-kik, *n.* Chinook, IKKIK. *A fish-hook.*

Ik-poo'-ie, *v.* Chinook, IKHPUL. *To shut.* Ikpooie la pote, *shut the door;* mamook ikpooie, *to surround;* ikpooie kwillan, *deaf.*

Ikt, or **Icht**, *adj.* Chinook, IKHT. *One; once.* Used also as the indefinite article. Ikt man, *a man;* ikt-ikt man, *some one or other; here and there one;* ikt nika klatawa kopa yakka house, *I have been once to his house.*

Ik'-tah, *pron.* Chinook, IKTA. *What.* Iktah okook, *what is that?* iktah mika tikegh, *what do you want?* iktah, *well, what now?*

Ik'-tah, *n.* From the foregoing. *A thing; goods; merchandise; clothing.* Hyiu tenas iktah, *a great many trifles.* The use of the same word for *what* and for *things*, has been noticed in some other languages of this coast.

Il'-la-hie, *n.* Chinook, ILAHEKH. *The ground; the earth; dirt.* Tipso illahie, *prairie;* saghallie illahie, *mountains, or high land; heaven;* hyiu illahie kopa, *dirty* (literally, *much dirt upon*).

In'-a-ti, or **Een-a-ti**, *prep., adv.* Chinook, INATAI. *Across; opposite to; on the other side of.* Inati chuck, *on the other side of the river;* klatawa inati, *to cross over.*

Ip'-soot, *v. a., v. n.* Chinook, ALHUPSO. *To hide one's self, or any thing; to keep secret.* Ipsoot klatawa, *to steal off;* ipsoot wau-wau, *to whisper.*

Is'-ick, *n.* Chinook, ISIK. *A paddle.* Mamook isick, *to paddle.*

Is'-ick stick, *n.* Chinook and English. *The ash.* Literally, *paddle-wood.*

Is'-kum, *v.* Chinook, idem. *To take; take hold of; hold; get.* Iskum okook lope, *hold on to that rope;* mika na iskum? *did you get it?*

It'-lan, or **It'h-lan**, *n.* Chinook, ITHLANA. *A fathom; the length of the extended arms.*

It'-lo-kum, *n.* Chinook, idem; Chihalis, SETLOKUM. *The game of "hand,"*—a common amusement. Mamook itlokum, *to gamble.*

Itl'-wil-lie, *n.* Chinook, ETLWILI. *The flesh; meat of any animal.* Konaway nika itlwillie sick, *all my flesh is sore.*

Its'-woot, or **Its'-hoot**, *n.* Chinook, ETSHHUT. *A black bear.* Itshoot paseesie, *thick dark cloth or blankets.*

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K.

Kah, *adv.* Chinook, KAKH. *Where; whither; whence.* Kah mika mitlite? *where do you live?* konaway kah, *everywhere;* kah-kah, *here and there.*

Kah'-kah, *n.* Chinook and Nisqually (by onoma.), SKAKA. *A crow.*

Káh-kwa, *adv.* Nootka; Tokwaht, ACHKO. *Like; similar to; equal with; as.* Kahkwa nika tumtum, *so I think* (literally, *such* [*is*] *my heart*); kahkwa hyas nika, *as large as I;* kahkwa spose, *as if;* kloshe kahkwa, *that is right; good so.*

Kah'-na-way, *n.* Chinook, T'KANAWÂ. *Acorns.* Kahnaway stick, *the oak.* Used only on the Columbia river.

Káhp-ho, *n.* Chinook, idem. *An elder brother, sister, or cousin.*

Káh-ta, *adv.* Chinook, KÁTA. *How; why.* Kahta mika mamook okook? *why do you do that?* kahta mika chahko? *how did you come?* kahta mika? *what is the matter with you?* pe kahta? *and why so?*

Kal-ak-a-láh-ma, *n.* Chinook, OKALAKALAMA. *A goose.* Used on the lower Columbia river.

Kal-a-kwáh-tie, *n.* Chinook, KALAKWATI; Clatsop, KL'WHELATL. *The inner bark of the cedar* (thuja); *the petticoat, or skirt, formerly worn by women, and often made of strands of bark.* Kalakwahtie stick, *the cedar-tree.*

Ka-li'-tan, *n.* Chinook, TKLAITAN. *An arrow; shot; a bullet.* Kalitan le sac, *a quiver; a shot-pouch.*

Kal-lak'-a-la, or **Kul-luk'-ul-la**, *n.* Chinook, KALÁKALA. *A bird.*

Kám-ass, or **Lá-kam-ass**, *n.* Nootka. *The Scilla esculenta,*—a bulbous root used for food by the Indians. Jewitt gives CHAMASS as the Nootka for *fruit,* also for *sweet,* or *pleasant to the taste.*

Kám-ooks, *n.* Chinook, KLKÁBOKES. *A dog.* Kahkwa kamooks, *like a dog; beastly.*

Ka-mo'-suk, *n.* Chinook, idem. *Beads.* Tyee kamosuk (chief beads), *the large blue glass beads.*

Kap-su-ál-la. Quære u. d. *To steal.* Kapsualla klatawa, *to steal away;* kapsualla mamook, *to do secretly.*

Kát-suk, or **Kót-suk**, *n.* Chinook, idem. *The middle or centre of any thing.*

Kau'-py, *n.* English. *Coffee.*

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Ka-wák, *v.* Chihalis, KAUAK. *To fly.* Not in general use.

Káw-ka-wak, *adj.* Chinook, KÁKAWAK. *Yellow, or pale green.*

Keé-kwil-lie, *prep.* Chinook, KIK'HWILI. *Low; below; under; beneath; down.* Mamook keekwillie, *to lower;* mitlite keekwillie, *to set down; put under.* Not used in the sense of "down stream."

Keep'-wot, *n.* Chinook, OKWÉPOWA; Yakama, KAPUS, *a pin* (Pandosy). *A needle; the sting of an insect; a thorn.* Shoes keepwot, *an awl.*

Keh'-loke, *n.* Chinook, idem. *A swan.* Of local use only.

Keh'-see, or **Ki'-su**, *n.* Chinook, EKÉSO. *An apron.*

Kéh-wa, *adv.* Quære u. d. *Because.* Not in common use.

Kel'-a-pi, or **Ká-la-pi**, *v.* Chinook, KELAPAI. *To turn; return; overturn; upset.* Kelapi canim, *to upset a canoe;* hyak kelapi, *come back quickly;* kelapi kopa house, *go back to the house;* mamook kelapi, *to bring, send, or carry back;* kelapi tumtum, *to change one's mind.*

Kes'-chi, or **Kéh-tsie**. Chinook, KUKHTSI (Anderson). *Notwithstanding; although.* Keschi yakka mamook kahkwa, *although he did so.* Not in common use.

Ket'-ling, or **Kit'-ling**, *n.* English. *A kettle; can; basin,* &c.

Kil-it'-sut, *n.* Chinook, OKWILIKTSHUT. *Flint; a bottle; glass.*

Kim'-ta, or **Kim-tah'**, *prep.* Chinook, KIMTA. *Behind; after; afterwards; last; since.* Klatawa kimtah, *go behind;* nika elip, pe yakka kimtah, *I first, and he afterwards;* okook kimtah, *the one behind;* kimtah nika nannitsh mika, *since I saw you.*

King Chautsh, *adj.* English, KING GEORGE. *English.* King chautshman, *an Englishman.*

Ki'-nootl, or **Ki'-noos**, *n.* Chinook, EKAINUTL. *Tobacco.*

Kish-kish, *v.* Chinook, idem. *To drive,* as cattle or horses.

Kiu'-a-tan, *n.* Chinook, IKIUATAN. Cooley kiuatan, *a race-horse;* stone kiuatan, *a stallion.*

Ki'-wa, *adj.* Wasco, KAIWA (Shaw). *Crooked.* Of only local use.

Ki'-yah, *n.* Chihalis, KAIYAKH. *Entrails.*

Klah, *adj.* Chinook, KLAKH. *Free or clear from; in sight.* EX. Chee yakka klah, *now he is in sight;* klatawa klah, *to escape, as a prisoner;* chahko klah (of seed), *to come up;* (of the woods), *to open out;* (of the weather), *to clear up;* mamook klah, *to uncover.* Mr. Anderson gives as the original meaning, *to open out or appear.*

Klah-hanie', or **Klagh-anie'**, *adv.* Chinook, KLAKHANI. *Out of doors; out; without.* EX. Mamook klaghanie okook, *put that out;* klatawa klaghanie, *to go out.*

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Kla'-how-ya. The ordinary salutation at meeting or parting. *How do you do? good-bye;* as, klahowya sikha, *good-bye, friend.*

Kla-hów-yum, *adj., n.* Chinook, KLAHÂUIA. *Poor; miserable; wretched; compassion.* Ex. Hyas klahowyum nika, *I am very poor;* mamook klahowyum, *to take pity on; give alms; be generous.*

The salutation above given probably originated in some whining reply to the first whites, and a distinction has since arisen between the two modes of spelling, which is, however, purely arbitrary.

Kláh-wa, *adv.* Chinook, KLAWAKH. *Slow; slowly.* Ex. Klatawa klahwa, *go slowly.*

Klak, *adv.* Chinook, KLAKW. [*To take*] *off.* Ex. Mamook klak stone kiuatan, *to castrate a horse;* mamook klak l'assiette, *take off the plates;* klak kopa wayhut, *get out of the road.*

Klák-sta, or **Kluk'-sta,** *pron.* Chinook, T'KLUKSTA. Ex. Klaksta mamook okook? *who made or did that?* halo klaksta, *no one.*

Klák-wun, or **Kléh-kwan,** *v.* Chihalis, KLAKWUN. *To wipe, or lick.* Klakwun l'assiette, *to wipe a plate.*

Klale, or **T'klale,** *adj.* Chinook, TLEHL. *Black, or dark blue, or green.*

Klap, *v.* Chinook, KLAP. *To find.* Ex. Mika na klap mika kiuatan? *did you find your horse?* klap tenas, *to be with child.*

Kla'-pite, *n.* Chinook, KLIPAIT. *Thread; twine.*

Klás-ka, or **Klus'-ka,** *pron.* Chinook, KLUSKA. *They; thine; them.*

Klat'-a-wa, *v.* Nootka, KLATTURWAH (Jewitt); Nittinât, KLATŌUKH. *To go.* Klatawa teáhwit, *to walk; go on foot;* klatawa kopa kiuatan, *to ride;* klatawa kopa boat, *to sail;* mamook klatawa, *to send.*

Kla-whâp, *n.* Chinook, KLHUAP. *A hole.* Mamook klawhap, *to dig a hole.*

Klem'-a-hun, *v.* Chihalis, idem. *To stab; to wound; to dart; to cast as a spear; to hook or gore as an ox.* Nika klemahun samun, *I spear salmon.*

Klihl, or **Klilt,** *adj.* Chinook, KLIHL. *Bitter.* Not of universal use. Mr. Hale makes it KLITL, *sour.*

Klik'-a-muks, *n.* Chinook, KLIKABUKS. *Blackberries,* or more properly *dewberries.*

Klik'-wal-lie, or **Kloke'-wal-lie.** Chinook, KLIKWALI. *Brass wire; an armlet or bracelet of brass wire.* Mr. Anderson gives the original meaning as simply *brass.*

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Klim-in'-a-whit, *n., v.* Chinook, KLIMINAWHUT. *A lie; to lie.* Hyas skumtuks kliminawhit, *he is a great liar* (literally, *he knows well how to lie*).

Klim'-min, or **Klimmin-klimmin**, *adj.* Chinook, TKLEMIN-TKLEMIN. *Soft; fine in substance.* The reduplication denotes the diminutive, but in jargon it is generally used singly. Ex. Klimmin sapoleel, *flour;* klimmin illahie, *mud; marshy ground;* mamook klimmin, *to soften as by dressing a skin.*

Klip, *adj.* Chinook, KELIPE; Chihalis, KLUPUTL; Nisqually, KLEP. *Deep; sunken.* Klip chuck, *deep water;* klip sun, *sunset.*

Klis'-kwiss, *n.* Chinook, idem. *A mat.*

Klógh-klogh, *n.* Chinook, OKLÓKHKLO. *Oysters.* The word is common to the Puget Sound tribes, as well as to the Chinooks.

Klo-náss, *adv.* Chinook, idem. Expression of uncertainty or doubt. *Perhaps; I don't know; may be so; who knows?* Equivalent to the Spanish *quien sabe.* Ex. Klonass nika klatawa, *perhaps I shall go.* Q. Kah mika kahpho? *where is your brother?* A. Klonass, *I don't know.*

Klone, *adj.* Chinook, TKLON. *Three.*

Klook, *adj.* English. *Crooked.* Klook teáhwit, *broken legged; lame.*

Klootch-man, *n.* Nootka and Tokwaht, KLUTSMA. *A woman;* a female of any animal. Tenas klootshman, *a girl;* klootchman kiuatan, *a mare.*

Klose, or **Kloshe**, *adj., adv.* Nootka; Tokwaht, KLOHTL; Makah, KLOTELO; Nisqually, KLOB. *Good; well; well enough.* Kloshe nannitsh, *look out; take care;* hyas kloshe, *very well.*

Klose-spose. Nootka, KLOHTL; English, SUPPOSE. *Shall or may I; let me.* Ex. Klose-spose nika mamook pia okook? *shall I cook that?* (literally, [*is it*] *good that I make cook that?*).

Klugh, or **Klugh-klugh**. Chinook, KLUKH. *To tear.* Mamook klugh illahie, *to plough* (literally, *to tear the ground*).

Kluk-ulh', or **Klak-alh'**, *adj.* Chihalis, TLUKUTLH. *Broad or wide*, as of a plank.

Ko, *v.* Chinook, idem. *To reach; arrive at.* Chee klaska ko, *they have just come;* kansih nesika ko kopa Nisqually? *when shall we reach Nisqually.*

Ko'-ko, *v.* Chinook (by onoma.). *To knock.* Koko stick, *a woodpecker.*

Kok'-shut, *v.* Nootka, KAKHSHETL; Klaokwat, KWÁCHITL. In the original, *dead. To break; broken; to beat.* Hyas kokshut, *broken to pieces.*

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Kon'-a-way, *adj.* Chinook, KÁNAWŁ. *All; every.* Klaska konaway klatawa, *they have all gone;* konaway tilikum, *everybody;* konaway kah, *everywhere.*

Koo'-sah, or **Kó-sah**, *n.* Chinook, EKÓSAKH. *The sky.* Only used on the Columbia.

Ko'-pa, *adv., prep.* Chinook, idem. *To; in; at; with; towards; of; about; concerning; there or in that place.* Ex. Kopa nika house, *at my house;* lolo okook kopa mika, *take that home with you* (equivalent to the French *chez vous*); cultus kopa nika, *it is nothing to me.* *Q.* Kah okook lope? *where is that rope?* *A.* (motioning with the chin towards the place) Kopáh.

Ko-pet', *v., adv.* Chinook, idem. *To stop; leave off; enough.* Kopet wau-wau, *stop talking;* kopet ikt, *only one;* kopet okook, *that's all;* wake siah kopet, *nearly finished;* kopet tomalla, *day after to-morrow.*

Kow, *v.* Chinook, KAU-KAU. *To tie; to fasten.* Kow mika kiuatan, *tie your horse;* ikt kow, *a bundle.*

Kull, *adj.* Chinook, K'HUL-K'HUL. *Hard in substance; difficult.* Chahko kull, *to become hard;* mamook kull, *to harden; to cause to become hard;* hyas kull spose mamook, *it is very hard to do so;* kull stick, *oak or any hard wood.*

Kul-lagh', or **Kul-lagh'-an**, *n.* Chihalis, KULLAKH; Lummi, KULLUKHAN. *A fence; a corral, or inclosure.* Kullagh stick, *fence rails.* In the original, it meant the stockade with which Indian houses are often surrounded.

Kum'-tuks, or **Káme-taks**, *v.* Nootka, KOMMETAK (Jewitt); Tokwaht, KUMITUKS; Clayoquot, KEMITAK. *To know; understand; be acquainted with; imagine; believe.* Mamook kumtuks, *to explain; teach;* hyas kumtuks solleks (literally, *well to understand anger*), *to be passionate;* kopet kumtuks, *to forget;* halo kumtuks, *stupid; without understanding;* (of a horse) hyas yakka kumtuks cooley, *he can run fast* (literally, *he knows well to run*); kumtuks kliminawhit, *to be a liar; to understand lyirg;* nika kumtuks okook tyee, *I know that chief;* nika kumtuks Klikatat wau-wau, *I understand the Klikatat language.*

Kun'-a-moxt, *adj.* Chinook, KONAWAY MOXT. *Both; together* (literally, *all two*). Kunamoxt kahkwa, *both alike.*

Kun'-sih, **Kan'-sih**, **Kun'-juk**, **Kun'-jie**, *adv.* Chinook, KUNSŁUKH. *How many; when; ever.* Kunsih tilikum mitlite? *how many people are there?* kunsih mika klatawa? *when do you go?* wake kunsih, *never;* mamook kunsih, *to count.*

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Kush'-is, *n.* Chihalis, KOSHIS. *Stockings.* In the original, any elastic article of dress. Not in general use.

Kwah'-ne-sum, *adv.* Chinook, KWÁNISUM; Yakama, KWÁLISIM. *Always; forever.*

Kwàh-nice, *n.* Klikatat, KWADDIS. *A whale.*

Kwáhta, *n.* English. *The quarter of a dollar.* The quarter of any number is usually expressed in Jargon by *tenas sitkum*, i. e., *a small half.*

Kwah'-tin. See YAKWAHTIN.

Kwaist, or **Kweest**, *adj.* Chinook, KWAITST. *Nine.*

Kwa-lal'-kwa-lal', *v.* Chinook, KWULLIL-KWULLIL. *To gallop.*

Kwal'h, *n.* Chihalis, KWATLH. *An aunt.*

Kwann, *adj.* Chinook, KWAN-KWAN. *Glad.* According to Mr. Anderson, it means a custom or habit. It is used by some in this sense as *tamed* or *broken*, as of a horse (McCormick). KWAL is Nisqually for *tame.*

Kwass, *n., adj.* Chinook, idem. *Fear; afraid; tame.* Mamook kwass, *to frighten; to tame.*

Kwates, or **Kwehts**, *adj.* Chihalis, KWETS. *Sour.*

Kwéh-kweh, *n.* Chinook, OKWÉKWE (by onoma.). *A mallard duck.* Used chiefly at mouth of the Columbia.

Kwék-wi-ens, *n.* Chihalis, idem. *A pin.* Of limited use.

Kwéo-kwéo, *n.* Chinook, T'KWEO-KWEO. *A ring; a circle.*

Kwetlh, *adj.* Chihalis, idem. (Anderson.) *Proud.* Not in general use.

Kwin'-num, *adj.* Chinook, KWENEM. *Five.*

Kwish, or **Kweesh**, *interj.* Refusing any thing contemptuously. Equivalent to "*No you don't.*" Used on the lower Columbia.

Kwit'-shad-ie, *n.* Nisqually, KWUTSHDIE. *The hare or rabbit.* Confined to Puget Sound.

Kwo-lann', or **Kwo-lah'-nie**, *n.* Chihalis, KWOLÀN; Nisqually, KWILANI. *The ear.* Halo kwolann, or, ikpooie kwolann, *deaf.*

Kwulh, or **Kwult**, *v.* Chinook, KWULT'H. *To hit; to wound with an arrow or gun; to strike with a stick or stone; or in any manner without cutting; to hit.*

Kwun'-nun, *n.* Chihalis, idem. *A count; numbers.* Ex. Mamook kwunnun, *to count.* Of merely local use.

Kwutl, *adj.* Chinook, idem. Literally, *fast. To push or squeeze*, as in packing; hyas mamook kwutl, *haul tight.*

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L.

La-bleed', *n.* French, La bride. *A bridle.*

La-boos', *n.* French, La bouche. *The mouth; mouth of a river* Moxt laboos, *the forks of a river.*

La-boo-ti', *n.* French, La bouteille. *A bottle.*

La-ca-lat', *n.* French, La carotte. *A carrot.*

La-ca-set', *n.* French, La casette. *A box, trunk, or chest.*

La-clo-a, *n.* French, La croix. *A cross.*

Lagh, *v.* Chinook, Lakh. *To lean; to tip, as a boat; to stoop; to bend over, as a tree.* Wake mika lagh kopa okook house, *don't lean against that house.*

La-gome, *n.* French, La gomme. *Pitch; glue.* La gome stick, *light-wood; the pitch-pine.*

La-gwin', or **La-kween'**, *n.* Quære u. d. *A saw.*

La-hál. See Slahal.

Lahb, *n.* French, L'herbe. The arbutus *uva ursi*, the leaves of which are used in smoking, alone or mixed with tobacco.

La-hásh, *n.* French, La hache. *An axe or hatchet.*

La-kam-mas'. See Kamass.

Lak'-it, or **Lok'-it**, *adj.* Chinook, Lakt. *Four; four times.* Lakit taht-lelum, *forty.*

La'-kles, *n.* French, La graisse. *Fat; oil.* See, also, Glease.

La-láh, *v.* Chinook, Lakhwhola. *To cheat; fool; to practise jokes.* Mamook lalah, *to make fun.*

La-lahm', or **La-lum'**, *n.* French, La rame. *An oar.* Mamook lalahm, *to row.*

La-láng, *n.* French, La langue. *The tongue; a language.*

La-leem', *n.* French, La lime. *A file.*

La-messe', *n.* French, idem. *The ceremony of the mass.*

La-més-tin, or **La-mó-tchin**, *n.* French, La médecine. *Medecine,* not including magic.

Lam'-mi-eh, or **Lam-mi-i**, *n.* French, La vieille. *An old woman.*

La-món-ti, or **La-mó-ti**, *n.* French, La montagne. *A mountain.*

La-peep', *n.* French, La pipe. *A tobacco-pipe.* Lapeep kullakala (literally, the "pipe-bird"), *the band-tailed eagle,* as its feathers were used to ornament the pipe stems.

La-péhsh, *n.* French, La perche. *A pole; the setting-pole of a boat or canoe.*

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La-pel-láh, *v.* Quære if from the French, Le foyer. Mamook lapellah, *to roast before the fire.*

La-pelle', *n.* French, La pelle. *A shovel or spade.*

La-pe-osh', *n.* French, La pioche. *A mattock; a hoe.*

La-piége, *n.* French, La piége. *A trap.* Eena la piége, *a beaver-trap.*

La-plash, *n.* French, La planche. *A board.*

La-po-el', *n.* French, La poêle. *A frying-pan.* Mamook lapoel, *to fry.*

La-póme, *n.* French, La pomme. *An apple.*

La-pool', *n.* French, La poule. *A fowl; poultry.* Siwash lapool, *the grouse.*

La-poo-shet', *n.* French, La fourchette. *A fork.*

La-póte, *n.* French, La porte. *A door.*

La-sánjel, *n.* French, La cingle. *A girth; a sash; a belt.*

La-sée, *n.* French, La scie. *A saw.*

La-sell', *n.* French, La selle. *A saddle.*

Lá-shal-loo, or **Lá-shal-lee**, *n.* French, La charrue. *A plough.*

La-shán-del, *n.* French, La chandelle. *A candle.*

La-sháse, *n.* French, La chaise. *A chair.*

La-shen', *n.* French, La chaine. *A chain.*

Las-siet', *n.* French, L'assiette. *A plate.*

La-sway, *n., adj.* French, La soie. *Silk; silken.*

La-táhb, *n.* French, La table. *A table.*

La-tet', *n.* French, La tête. *The head.* Pil latet, *red-headed.*

La-tlah', *n.* French, Train; as, "ne faites pas de train." (Anderson). *A noise.* Mamook latlah, *to make a noise.*

La-wen', *n.* French, L'avoine. *Oats.*

La-west', *n.* French, La veste. *A waistcoat.*

Lazy, *adj.* English, idem. *Lazy.*

Le-báh-do (often pronounced lab'-a-do), *n.* French, Le bardeau. *A shingle.*

Le-bal', *n.* French, idem. *A ball; bullet.* Tenas lebal, *shot.*

Le-bis'-kwie, *n.* French, Le biscuit. *Biscuit; crackers; hard bread.*

Le-blau', *n., adj.* French, Le blond. *A sorrel horse; chestnut colored.*

Le-clem', *n., adj.* French, Le crême. *Cream-colored; a cream colored or light dun horse.*

Le-cock', *n.* French, Le coq. *A cock; a fowl.*

Le-doo', *n.* French, Le doigt. *A finger.*

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Le-gléy, *n., adj.* French, LE GRIS, or English GRAY, with French article. *A gray horse; gray.*

Le-jaub'. See DIAUB.

Le-kléh, *n.* French, LE CLEF. *A key.* Mamook le kleh, *lock the door.*

Le-kloo', *n.* French, LE CLOU. *A nail; nails.*

Le-koo', *n.* French, LE COU. *The neck.*

Le-ky'e, *n., adj.* Mr. Anderson derives this from a Canadian word *caille*, meaning a *piebald horse.* In its jargon use, it means, also, *a spot, spotted*, or *speckled;* as, lekye salmon, *the spotted or winter salmon* (*salmo canis*, Suckley).

Le-lo'-ba, *n.* French, LE RUBAN. *A ribbon.*

Le-loo', *n.* French, LE LOUP. *A wolf* (the large wolf).

Le-máh, or **Léh-ma**, *n.* French, LA MAIN. *The hand; the arm.* Kloshe lemáh, *the right* (literally, *the good hand*); potlatch lemah, *shake hands.*

Le-máh-to, *n.* French, LE MARTEAU. *A hammer.*

Le-mel', *n.* French, LE MULET. *A mule.*

Le-mo'-lo, *n., adj.* French Canadian, LE MORON; undoubtedly a corruption of MARRON, *a runaway negro. Wild; untamed.* It applies to men as well as animals, as, for instance, to the tribes which have had no intercourse with the settlements.

Le-moo'-to, or **Lam'-mu-to**, *n.* French, LES MOUTONS. *Sheep.*

Le-pan', *n.* French, LE PAIN. *Bread; raised or light bread.*

Le-pee', *n.* French, LE PIED. *The feet.*

Le-pish'-e-mo, *n.* Quære u. d. *The saddle-blanket and housings of a horse.*

Le-plét, *n.* French, LE PRÊTRE, *A priest.*

Le-pwau', *n.* French, LES POIS. *Peas.*

Le-sak', *n.* French, LE SAC. *A bag; a pocket.*

Le-sap', or **Le-zep'**, *n.* French, LES ŒUFS. *An egg; eggs.*

Le-sée-blo, *n.* French, LES ÉPERONS. *Spurs.*

Le-sée-zo, *n.* French, LE CISEAU. *Scissors.*

Le-sóok, *n.* French, LE SUCRE. *Sugar.*

Le-táh, *n.* French, LE DENT. *The teeth.*

Le-whet', *n.* French, LE FOUET. *A whip.* Mamook lewhet, *to whip.*

Lice, *n.* English. *Rice.*

Lik-pu'-hu, or **Lik'-po**, *n.* (Hale.) *An elder sister.* Mr. Hale gives this as a Chinook word. If so, it is probably a corruption of KUP'HO. It is not used in Jargon.

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Lip'-lip, *v.* By onoma. (Hale). *To boil.* Mamook liplip, *to make, or cause to boil.*

Ló-lo, *v.* Chinook, idem. Originally, to carry a child on the back. In Jargon, used in a more extended sense. *To carry; to load.* Lolo kopa tsiktsik, *to carry in a cart.* Mamook lolo kopa canim, *to load into a canoe.*

Lo-lo', *adj.* Chinook, Lowullo. *Round; whole; the entire of any thing.* Lolo sapeleel, *whole wheat;* mamook lolo, *to roll up* (Shaw).

Lope, *n.* English, Rope. *A rope.* Tenas lope, *a cord;* skin lope, *a raw hide, riata, or thong.*

Luk'-ut-chee, or **Lá-kwit-chee**, *n.* French, La coquille. (?) *Clams.* Used chiefly on Puget Sound.

Lum, *n.* English, Rum. *Spirits of any sort.*

M.

Máh-kook, *v., n.* Nootka, Màkuk; Nittinat and Tokwaht, idem; Makah, Bákwatl. *To buy or sell; trade or exchange; a bargain.* As their buying and selling was merely barter, the same word always answered for both operations. Kah mika mahkook okook calipeen? *where did you buy that rifle?* hyas mahkook, *dear;* tenas mahkook, *cheap.*

Máh-kook-house. *A trading-house or a store.*

Máh-lie, *v.* Nisqually. *To forget.* Of local use on Puget Sound.

Mahsh, *v. a.* French, Marcher. *To leave; to turn out; to throw away; to part with; remove.* Ex. Mahsh chuck kopa boat, *bail the boat out;* mahsh okook salmon, *throw away that fish;* mahsh maika capo, *take off your coat;* mahsh! (to a dog) *get out!* mahsh tenas, *to have a child; to be delivered;* yakka mahsh tum-tum kopa nika, *he has given me his orders, or told me his wishes;* mahsh kow, *to untie;* mahsh stone, *to castrate.*

Máh-sie, *v.* French, Mercie. *Thank you.*

Máht-lin-nie, *adv.* Chinook, Màtlini. *Off shore.* (In boating), *keep off!* (if on land), *towards the water.*

Máht-wil-lie, *adv.* Chinook, Màthwili. *In shore; shoreward.* (As a command), *keep in;* (on land), *towards the woods, or the interior.*

Ma-láh, *n.* Chinook, Malagh. *Tinware; crockery; earthenware.*

Mal-i-éh, *v.* French, Marier. *To marry.*

Ma'-ma, *n.* English, Mamma. *A mother.*

Mam'-ook, *v. a.* Nootka, Mamuk. *To make; to do; to work.* It

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is the general active verb, and is used largely in combination with nouns and other verbs; as, mamook chahko, *make to come, fetch;* mamook kelipai, *bring or send back;* mamook sick, *to paddle;* mamook illahee, *to dig.*

Man, *n.* English, idem. *A man; the male of any animal.* Ex. Man moolock, *a buck elk;* tenas man, *a young man or boy.*

Mél-a-kwa, or **Mál-a-kwa**, *n.* French, MARANGOUIN. (Anderson.) *A mosquito.*

Mel'-ass, *n.* French, MELASSE. *Molasses.*

Mem'-a-loost, *v., n., part.* Chinook, MÉMALUST. *To die; dead.* Mamook memaloost, *to kill.*

Me-sáh-chie, *adj.* Chinook, MASÁCHI. *Bad; wicked.*

Me-si'-ka, *pron.* Chinook, MESÁIKA. *You; your; yours.*

Mi'-ka, *pron.* Chinook, MÁIKA. *Thou; thy; thine.*

Mi'-mie, *adv.* Chinook, MÁIAMI. *Down stream.*

Mist-chi'-mas, n. Quære u. d. *A slave.* Dr. Scouler gives this word as Nootka and Columbian. Mr. Hale makes it Chinook. It is certainly, however, neither Chinook nor Chihalis; and Jewitt gives *kakoelth* as Nootka, while I find the Makah word *kotlo*, and the Nittinat *kotl.*

Mit-áss, *n.* Cree, MITAS. (Anderson.) *Leggings.* A word imported by the Canadian French.

Mit'-lite, *v.* Chinook, MITLAIT. *To sit; sit down; stay at; reside; remain.* It is also used in place of *to have* and *to be.* Ex. Mitlite kopa house, *he is in the house;* mitlite hyiu salmon kopa mika? *have you plenty of salmon?* mitlite (*imp.*), *sit down;* cultus mitlite, *to stop anywhere without particular object;* mitlite tenas, *to be with child;* mitlite keekwillie, *to put down.*

Mit'-whit, *v.* Chinook, AMETWHET. *To stand; stand up.* Mitwhit stick, *a standing tree; a mast.*

Mokst, *adj.* Chinook, MAKST. *Two; twice.*

Moo'-la, *n.* French, MOULIN. *A mill.* Stick moola, *a saw-mill.*

Moo'-lock, *n.* Chinook, EMÚLUK. *An elk.* This word, strangely enough, occurs also in the Koquilth of Humboldt Bay.

Moon, *n.* English, idem. *The moon.* Ikt moon, *a month;* sick moon, *the wane or old moon.*

Moos'-moos, *n.* Klikatat, MÚSMUS; Chinook, EMÚSMUS. *Buffalo, horned cattle.* The word, slightly varied, is common to several languages. Mr. Anderson derives it from the Cree word *moostoos*, a buffalo, and supposes it to have been imported by the Canadians; but Father Pandosy makes *musmus* Yakama.

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Moo'-sum, *v.*, *n.* Chihalis, MÚSAM. *To sleep; sleep.* Tikegh moosum, *or* olo moosum, *to be sleepy* (literally, *to want, or be hungry for, sleep*); nika hyas moosum, *I slept very sound.*

Mów-itah, or **Mah'-witsh**, *n.* Nootka, MAUITSH (Hale); Nittinat, MOITSH, *a deer;* Nootka, MOOWATSH, *a bear* (Jewitt). *A deer; venison.* Frequently used to signify a wild animal; as, hul-oima mowitch, *a strange or different kind of beast.* The meaning given in Jewitt's book is probably a misprint. Like *moolock*, an elk, the word is found in the Koquilth of Humboldt Bay.

Múck-a-muck, *n.*, *v.* Quære u. d. MAKAMAK (Hale). *To eat; to bite; food.* Muckamuck chuck, &c., *to drink water, or other liquid.* Neither Chinook nor Chihalis. Mr. Anderson considers it an invented word.

Mus'-ket, *n.* English, idem. *A gun or musket.* Stick musket, *a bow.*

N.

Na. The interrogative particle. Ex. Mika na klatawa okook sun? *do you go to-day?* Interrogation is, however, often conveyed by intonation only.

Na-áh, *n.* Chinook, TKANÁA. *A mother.* (Hale.) Peculiar to the Columbia, and now in fact obsolete, the English MA'MA being used instead.

Nah, *interj.* Common to several languages. *Look here! I say!* Nah sikhs! *halloo, friend!* Also used in common conversation to call attention to some point not thoroughly understood. In the Yakama language, it is the sign of the vocative; as, nah tehn! *O man.*

Nan'-itah, *v.* Quære u. d. *To see; look; look for; seek.* Nanitah! *look there!* kloshe nanitah! *look out! take care!* cultus nanitah, *to look round idly, or from curiosity only.* Mamook nanitah, *to show.* The word is neither Chinook nor Chihalis. Dr. Scouler gives *nannanitch* as Nootka and Columbian. It is possibly the former.

Nau'-its, *adv.* Chihalis, NOITSH. Mr. Hale gives this for *off shore; on the stream.* It means, according to Mr. Anderson, the *sea-beach*, and is not properly a Jargon word.

Na-wit'-ka, *adv.* Chinook, idem; Klikatat and Yakama, N'WITKA. *Yes; certainly; yes indeed; to be sure.* Nawitka wake nika kumtuks, *indeed I don't know.* In answer to a negative question, many Indians use it as affirming the negative. Ex. Wake mika nanitsh? *did you not see* [*it*]? Nawitka, *I did not.*

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Nem, *n.* English, NAME. *A name.* Mamook nem, *to name, or call by name.*

Ne-nám-ooks, *n.* Chinook, ENANÁMUKS. *The land otter.*

Ne-si'-ka, *pron.* Chinook, NISÁIKA. *We; us; our.*

Ne'-whah. Chinook, NIWHA. It seems to be an adverb used, as is often the case, as a verb, the meaning being *hither, come,* or *bring it hither.* EX. Newhah nika nanitsh, *here, let me see it.*

Ni'-ka, *pron.* Chinook, NAIKA. *I; me; my; mine.*

Nose, *n.* English, idem. *The nose;* also, *a promontory.* Boat nose, *the bow of a boat.*

O.

O'-koke, or **O'-kook**, *pron.* Chinook, OKŌK. *This; that; it.* Iktah okook? *what is that?* okook sun, *to-day;* okook klaksta, *he who;* okook klaska, *they* (being present). It is often abbreviated to *oke;* as, *oke sun.*

O'-la-pits-ki, *n.* Chinook, OŏLPITSKI. (Hale.) *Fire.* Not properly a Jargon word.

O'-le-man, *n., adj.* English, OLD MAN. *An old man; old; worn out.* Hyas oleman kiuatan, *a very old horse.* As regards articles, used in the sense of worn out.

Ol'-hy-iu, *n.* Chinook, OLHAIYU. *A seal.*

O'-lil-lie, or **O'-lal-lie**, *n.* Belbella, idem. (Tolmie.) Originally the salmon berry. Chinook, KLÁLELLI, *berries in general. Berries.* Shot olillie, *huckleberries;* siahpult olillie, *raspberries;* salmon olillie, *salmon berries,* &c. On Puget Sound, always called OLALLIE.

O'-lo, *adj.* Chinook, idem. *Hungry.* Olo chuck, *thirsty;* olo moosum, *sleepy.*

O'-luk, *n.* Chihalis, idem. *A snake.*

O'-na, *n.* Chinook, EÓNA. *The razor fish or solen; clams.* Used only at mouth of the Columbia.

Oos'-kan, *n.* Chinook. *A cup; a bowl.*

O'-pe-kwan, *n.* Chinook, ÓPEKWANH. *A basket; tin kettle.*

O'-pitl-kegh, *n.* Chinook, ÓPTLIKE. *A bow.*

O'-pit-sah, *n.* Chinook, ÓPTSAKH. *A knife.* Opitsah yakka sikhs (*the knife's friend*), *a fork.* The word is also used to denote *a sweetheart.*

O'-poots, or **O'-pootsh**, *n.* Chinook, OBÉPUTSH, *the fundament. The posterior; the fundament; the tail of an animal.* Boat opoots, *the rudder;* opoots-sill, *a breech clout.*

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Óte-lagh, *n.* (Hale.) Chinook, Oötlakh. *The sun.* Not properly a Jargon word.

Ow, *n.* Chinook, Au. *A brother younger than the speaker.*

P.

Pahtl, *adj.* Chinook, Pátl. *Full.* Pahtl lum *or* paht-lum, *drunk;* pahtl chuck, *wet;* pahtl illahie, *dirty;* mamook pahtl, *to fill.*

Paint, or **Pent**, *n., adj.* English, Paint. Mamook pent, *to paint.*

Papa, *n.* English, idem. *A father.*

Pa'see-sie, *n.* Chinook, Pasísi. *A blanket; woollen cloth.*

Pa-si'-ooks, *n., adj.* Chinook, Pasísiuks. *French; a Frenchman.* Mr. Hale supposed this to be a corruption of the French word *Français.* It is, however, really derived from the foregoing word, Pasisi, with the terminal uks, which is a plural form applied to living beings. Lewis and Clarke (vol. ii., p. 413) give *Pashisheooks*, clothmen, as the Chinook name for the whites, and this explanation was also furnished me by people of that tribe. It has since been generally restricted to the French Canadians, though among some of the tribes east of the Cascade Range, it is applied indiscriminately to all the Hudson's Bay people.

Pchih, or **Pit-chih**, *adj.* Quære u. d. *Thin in dimension*, as of a board. (Shaw.) Not in common use.

Pe-chúgh, *adj.* Chinook, Ptsekh. *Green.*

Pee, *conj.* French, Puis. (Anderson.) *Then; besides; and; or; but.* Pee weght, *and also; besides which;* pee nika wauwau wake, *but I say, No.*

Peh'-pah, *n.* English, Paper. *Paper; a letter; any writing.* Mamook pehpah, *to write.*

Pel'-ton, *n., adj.* Jargon. *A fool; foolish; crazy.* Kahkwa pelton, *like a fool;* hyas pelton mika, *you are very silly.*

The Indians adopted this word from the name of a deranged person, Archibald Pelton, or perhaps Felton, whom Mr. Wilson P. Hunt found on his journey to Astoria, and carried there with him. The circumstance is mentioned by Franchère, in his "Narrative," trans. p. 149.

Pe-shak', or **Pe-shuk'**, *adj.* Nootka, Peshuk; Nittinat, idem. *Bad.*

Pe-what'-tie, *adj.* Chinook, Pihwátl. *Thin*, like paper, &c.

Pi'-ah, *n., adj.* English, Fire. *Fire; ripe; cooked.* Mamook piah, *to cook; to burn;* piah-ship, *a steamer;* piah olillie, *ripe berries;*

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piah sapolill, *baked bread;* piah sick, *the venereal disease;* saghillie piah, *lightning.*

Pil, *adj.* Chinook, TLPELPEL. Father Pandosy gives PILPILP, as signifying *red*, in the Nez Percé or Sahaptin, also. *Red; of a reddish color.* Pil illahie, *red clay or vermilion;* pil dolla, *gold;* pil chickamin, *copper;* pil kiuatan, *a bay or chestnut horse.*

Pil'-pil, *n.* Jargon. *Blood.* Mahsh pilpil, *to bleed; to menstruate.* Derived from the foregoing.

Pish, *n.* English. *Fish.*

Pit-lilh', or **Pit-hlil'**, *adj.* Quære u. d. *Thick in consistence*, as molasses.

Piu-piu, *n.* French, PUER, *to stink.* Or from the sound often uttered expressive of disgust at a bad smell. *A skunk.*

Poh, *v.* Chinook, idem. By onoma. Mamook poh, *to blow out or extinguish*, as a candle.

Po'-lak-lie, *n., adj.* Chinook, POLAKLI. *Night; darkness; dark.* Tenas polaklie, *evening;* hyas polaklie, *late at night; very dark;* sit-kum polaklie, *midnight* (literally, *the half night*).

Po'-lal-lie, *n.* Quære French, POUDRE. *Gunpowder; dust; sand.* Polallie illahie, *sandy ground.* The word is certainly neither Chinook nor Chihalis.

Poo, *n.* By onoma. (Hale.) *The sound of a gun.* Mamook poo, *to shoot;* moxt poo, *a double-barrelled gun;* tohum poo, *a six-shooter.* Nisqually, OPOO, *to break wind.*

Poo'-lie, *adj.* French, POURRI. *Rotten.*

Pot'-latch, or **Paht'-latsh**, *n., v.* Nootka, PAHCHILT (Jewitt); PACHAETL, or PACHATL (Cook). *A gift; to give.* Cultus potlatch, *a present or free gift.*

Pow'-itsh, *n.* Chinook, PAUITSH. *A crab-apple.*

Puk'-puk, *n.* Probably an invented word. *A blow with the fist; a fist-fight.* Mamook pukpuk, *to box; to fight with the fists;* pukpuk solleks, *to fight in anger.*

Puss'-puss, *n.* English. *A cat.* On Puget Sound, pronounced *pish-pish.* Hyas pusspuss, *a cougar.*

S.

Ságh-a-lie, or **Sah'-ha-lie**, *adj.* Chinook, SAKHALI; Clatsop, UKHSHAKHALI. *Up; above; high.* Saghalie tyee (literally, *the chief above*), *God.* A term invented by the missionaries for want of a native one.

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Sail, or **Sill**, *n.* English, SAIL. *A sail; any cotton or linen goods.* Mamook sail, *to make sail;* mamook keekwillie sail, *to take in sail;* tzum sail, *printed cloth or calico.*

Sa-kol'-eks, or **Se-kol'-uks**, *n.* Chinook, TSAKÁLUKS, *leggings. Trowsers; pantaloons.* Keekwillie sakoleks, *drawers.*

Sal-lal', *n.* Chinook, KLKWUSHALA. (SHELWELL of Lewis and Clarke.) *The sallal berry;* fruit of *gualtheria shallon.*

Salmon, *n.* English, idem. *The salmon; fish generally.* Tyee salmon, i.e., *chief salmon, the spring salmon* (*salmo kwinnat*, Rich.); masahchie salmon, *a winter species* (*salmo canis*, Suckley); tzum salmon, *salmon trout.*

Salt, *n., adj.* English, idem. *Salt, or a salt taste.* Salt chuck, *the sea.*

Sán-de-lie, *n., adj.* French, CENDRÉ. *Ash-colored.* (Anderson.) *A roan horse; roan-colored.*

Sap'-o-lill, *n.* Chinook, TSÁPELIL. *Wheat, flour, or meal.* Piah sapolill, *baked bread;* lolo sapolill, *whole wheat.* The word has been erroneously supposed to come from the French *la farine.* It is, however, a true Indian word, and seems common to various Columbia river tribes. Pandosy gives SAPLIL as Yakama for *bread;* Lewis and Clarke write it CHAPELELL.

Se-áh-host, or **Se-agh'-ost**, *n.* Chinook, SIÁKHOST, *the face. The face; the eyes.* Halo seahhost, *blind;* icht seahhost, *one-eyed;* lakit seahhost (*four eyes*), *or* dolla seahhost, *spectacles.*

Se-áh-po, or **Se-áh-pult**, *n.* French, CHAPEAU. *A hat or cap.* Seahpult olillie, *the raspberry.*

Shame, or **Shem**, *n.* English, idem. *Shame.* Halo shem mika! *arn't you ashamed of yourself?*

Shán-tie, *v.* French, CHANTER. *To sing.*

She-lok'-um, *n.* Chinook, TSHAILAKUMIT. (Anderson.) *A looking-glass; glass.*

Ship, *n.* English, idem. *A ship or vessel.* Stick ship, *a sailing vessel;* piah ship, *a steamer;* ship-man, *a sailor.*

Shoes, *n.* English, idem. *Shoes; skin shoes; moccasins.* Stick shoes, *boots or shoes made of leather.*

Shot, *n.* English, idem. *Shot; lead.* Shot olillie, *huckleberries.*

Shu'-gah, or **Shu'-kwa**, *n.* English. *Sugar.*

Shugh, *n.* Chinook, SHUKHSHUKH. *A rattle.* An imitation doubtless of the sound. (Anderson.) Shugh-opoots, *a rattlesnake.*

Shut, *n.* English, SHIRT. *A shirt.*

Shwáh-kuk, *n.* Chihalis, SHWAKÉUK. *A frog.*

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Si-áh, *adj.* Nootka, SAIÁ. *Far; far off.* Comparative distance is expressed by intonation or repetition; as, siah-siah, *very far;* wake siah, *near, not far.* Jewitt gives SIEYAH as the *sky* in Nootka, which was perhaps the true meaning, or, more probably, they called the sky "the afar."

Si-am, *n.* Chinook, ISHAIEM. *The grizzly bear.*

Sick, *adj.* English, idem. *Sick.* Cole sick, *the ague;* sick tumtum, *grieved; sorry; jealous; unhappy.*

Sikhs, or **Shikhs**, *n.* Chinook, SKASIKS; Sahaptin, SHIKSTUA. (Pandosy.) *A friend.* Used only towards men.

Sin'-a-moxt, *adj.* Chinook, SINIMAKST. *Seven.*

Si'-pah, *adj.* Wasco. (Shaw.) *Straight,* like a ramrod. Of only local use.

Sis'-ki-you, *n.* Cree. (Anderson.) *A bob-tailed horse.*

This name, ludicrously enough, has been bestowed on the range of mountains separating Oregon and California, and also on a county in the latter State. The origin of this designation, as related to me by Mr. Anderson, was as follows. Mr. Archibald R. McLeod, a chief factor of the Hudson's Bay Company, in the year 1828, while crossing the mountains with a pack train, was overtaken by a snow storm, in which he lost most of his animals, including a noted bob-tailed race-horse. His Canadian followers, in compliment to their chief, or "bourgeois," named the place the Pass of the Siskiyou,—an appellation subsequently adopted as the veritable Indian name of the locality, and which thence extended to the whole range, and the adjoining district.

Sit'-kum, *n., adj.* Chinook, SITKUM (Anderson); Clatsop, ASITKO. *A half; a part.* Sitkum dolla, *half a dollar;* sitkum sun, *noon;* tenas sitkum, *a quarter, or a small part.*

Sit'-lay, or **Sit'-li-ay**, *n.* French, LES ETRIERS. (Anderson.) *Stirrups.*

Sit'-shum, *v.* Chihalis, idem. *To swim.*

Si'-wash, *n., adj.* French, SAUVAGE. *An Indian; Indian.*

Skin, *n.* English, idem. *Skin.* Skin shoes, *moccasins;* stick skin, *the bark of a tree.*

Skoo'-kum, or **Skoo-koom'**, *n., adj.* Chihalis, SKUKUM. *A ghost; an evil spirit or demon; strong.* Skookum tumtum, *brave;* skookum chuck, *a rapid.*

Skwak'-wal, *n.* Chinook, SKAKULH (Anderson); Clatsop, SKAKOLI. *A lamprey eel.* Of local use only.

Skwis'-kwis, *n.* Chinook, Cathlamet dialect. *A squirrel.*

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Sla-hal', *n.* Chinook, ETLALTLAL. *A game played with ten small disks, one of which is marked.*

Smet'-ocks, *n.* Chihalis, SMETTAKS. *The large clam* (*Lutraria*). Used only at the mouth of the Columbia river.

Smoke, *n.* English, idem. *Smoke; clouds; fog; steam.*

Snass, *n.* Quære u. d. *Rain.* Cole snass, *snow.* The word is neither Chinook nor Chihalis, and is perhaps manufactured.

Snow, *n.* English, idem. *Snow.*

Soap, *n.* English, idem. *Soap.*

So-le'-mie, *n.* Chinook, SULAMICH (Anderson); Clatsop, SHŌLBE. *The cranberry.*

Sol'-leks, or **Sah'-leks**, *n., adj.* Quære u. d. *Anger; angry.* Mamook solleks, *to fight;* tikegh solleks, *to be hostile;* kumtuks solleks, *to be passionate.*

So'-pe-na, *v.* Chinook, TSOPENA. *To jump; to leap.*

Spo'-oh, or **Spo'-eh**, *adj.* Chinook, idem. *Faded; any light color,* as pale blue, drab, &c. Chahko spoeh, *to fade.*

Spoon, *n.* English, idem. *A spoon.*

Spose, *conj.* English, SUPPOSE. *If; supposing; provided that; in order that.* Spose mika nanitsh nika canim, *if you see my canoe;* spose nika klatawa kopa Chinook, *if or when I go to Chinook;* kahkwa spose, *as if.* See KLOSHE SPOSE.

Stick, *n., adj.* English, idem. *A stick; a tree; wood; wooden.* Stick skin, *bark;* ship stick, *a mast;* mitwhit stick, *a standing tree;* icht stick, *a yard measure;* stick shoes, *leather shoes or boots,* as distinguished from skin shoes or moccasins; kull stick, *oak* (hard wood); isick stick, *the ash* (paddle wood).

Stock'-en, *n.* English. *Stockings or socks.*

Stoh, *adj.* Chinook, idem. *Loose.* Mamook stoh, *to untie; unloose; undo.* Metaphorically, *to absolve.*

Stone, *n.* English, idem. *A rock or stone; bone; horn; the testicles.* Stone kiuatan, *a stallion;* mahsh stone, *to castrate.*

Stote'-kin, *adj.* Chinook, STOKTKIN. *Eight.*

Stutch'-un, *n.* English, STURGEON. *The sturgeon.*

Suk-wal'-al, *n.* Chinook (Hale); Clatsop, SHUKWALÀLA, *a gun or musket.* No longer used in Jargon.

Sun, *n.* English, idem. *The sun; a day.* Tenas sun, *early;* sitkum sun, *noon;* klip sun, *sunset.*

Sun'-day, *n.* English, idem. *Sunday.* Icht sunday, *a week;* hyas sunday, *a holiday.* A flag hoisted on a particular occasion is sometimes also called Sunday. The other days of the week are

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usually counted from this; as, icht, mokst, klone sun kopet Sunday, *one, two, or three days after Sunday.* Saturday used to be called at the Hudson's Bay Company's posts "muckamuck sun," *food day*, as the one on which the rations were issued.

T.

Tagh'-um, To'-hum, or **Tugh'-um,** *adj.* Chinook, TAKHUM; Cowlitz, TUKHUM; Kwantlen, TUKHUM'; Selish, TÁKKAN. *Six.*

Táhl-kie, or **Táhnl-kie,** *adv.* Chinook, TÁNLKI. *Yesterday.* Icht tahlkie, *day before yesterday.*

Táh-nim, *v.* Chihalis, idem. *To measure.* Of only local use, and not strictly Jargon.

Taht'-le-lum, or **Tot'-le-lum,** *adj.* Chinook, TATLELUM. *Ten.* The combinations from this are simple. Moxt, klone, &c., tahtlelum, signifying *twenty, thirty,* &c.; tahtlelum pe icht, &c., *eleven, twelve,* &c.

Tál-a-pus, *n.* Chinook, ITALIPAS; Yakama, TELIPA. (Pandosy.) *The coyote or prairie wolf.* A sort of deity or supernatural being, prominent in Indian mythology. *A sneak.*

Ta-máh-no-us, *n.* Chinook, ITAMÁNAWAS. *A sort of guardian or familiar spirit; magic; luck; fortune; any thing supernatural.* One's particular forte is said to be his *tamahnous.* Mamook tamahnous, *to conjure;* "*make medecine;*" masahchie tamahnous, *witchcraft or necromancy.* Mr. Anderson restricts the true meaning of the word to *conjuring.*

Ta-mo'-litsh, or **Ta-mow'-litsh,** *n.* Chinook, TAMULITSH (Anderson); Yakama, TAMOLITSH (Pandosy). *A tub; barrel; bucket* Icht tamolitsh, *a bushel measure.*

Tanse, *v., n.* English, DANCE. *To dance.*

T'chuk'-in, or **Tsugh'-ken.** See CHUCKIN.

Tea, *n.* English, idem. *Tea.*

Te-áh-wit, *n.* Chinook, TIÁWI; Clatsop, KLÀAWIT. *The leg; the foot.* Klatawa teahwit, *to go on foot; to walk;* klook teahwit, *lame.*

Téh-teh, *v.* Clatsop, TETEHAHA. *To trot,* as a horse. Of local use only.

Ten'-as, or **Tan'-as,** *n., adj.* Nootka, TANAS; Tokwaht, TENES. *Small; few; little; a child; the young of any animal.* Mokst nika tenas, *I have two children;* tenas hyiu, *a few;* tenas sun, *early.* Jewitt gives T'ANASSIS for *a child* in Nootka.

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Te-péh, *n.* Chinook, TEPEÉH. *Quills; the wings of a bird.*

Tik-égh, or **Tu-kégh**, *v.* Chinook, TIKEKH. *To want; wish; love; like.* Hyas tikegh, *to long for;* ikta mika tikegh? *what do you want?*

Tik'-tik, *n.* By onoma. *A watch.*

Til'-i-kum, *n.* Chinook, TILIKHUM. *People.* Applied generally, it means those who are not chiefs. Cultus tilikum, *common or insignificant persons;* huloima tilikum, *strangers;* nika tilikum, *my relations.* It is also used to signify a *tribe* or *band.*

Til'-i-kum-má-ma, *n.* (Hale.) Chinook, TLKAMÀMA. *A father.* The word is not in use in Jargon.

Till, or **Tull**, *adj., n.* English, TIRE. *Tired; heavy; weight; a weight.* Hyas till nika, *I am very tired;* kansih till okook, *how much does that weigh;* mamook till, *to weigh.*

Tin'-tin, *n.* By onoma. *A bell; a musical instrument.* Mamook tintin, *to ring a bell.* Among the Indians round the Hudson Bay Company's posts, the hours were thus known; as, mokst tintin kopet sitkum sun, *two hours,* i. e., *two bells after noon.*

T'kópe, *adj.* Chinook, idem. *White; light-colored.*

Tlehl. See KLALE.

Tl'kópe, *v.* Chinook, idem. *To cut; hew; chop.*

Toh, or **Tooh.** By onoma. Mamook toh, *to spit.* A manufactured word.

Tóke-tie, *adj.* Kalapuya. *Pretty.* Not in common use.

To'-lo, *v.* Kalapuya. *To earn; to win at a game; to gain.* Kansih dolla nika tolo spose mamook? *how many dollars will I earn if I work?*

To'-luks, *n.* Clallam, TOYUK. *The mussel.* Used on Puget Sound only.

To-mól-la, *adv.* English, TO-MORROW. Ikt tomolla, *or* copet tomolla, *the day after.*

Tot, *n.* Chihalis, TOT, or TAT. *An uncle.*

To'-to, *v.* By onoma. Chinook, TOKH-TOKH. *To shake; sift any thing; winnow.*

To-toosh', or **Ta-toosh'**, *n.* Chippeway, TOTOSH. (Schoolcraft.) *The breasts of a female; milk.* Totoosh lakles, *butter.*

To-wagh', *adj.* Chinook, TOWAKH. *Bright; shining; light.*

Tsee, *adj.* Chinook, idem. *Sweet.*

Tsee'-pie, *v.* Kalapuya. *To miss a mark; to mistake one's road; to make a blunder in speaking; to err or blunder.* Tseepie wayhut, *to take the wrong road.*

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Tshi'-ke, *adv.* (Hale.) Quære u. d. *Directly; soon.* Not Jargon.

Tshis, *adj.* Chinook, idem. *Cold.* Not in common use.

Tsi-át-ko, *n.* Chihalis, Nisqually, &c., idem; Clatsop, ÉCHIATKU *A nocturnal demon*, much feared by the Indians. The Skagits give this name to the "Couteaux," a tribe of Indians on Frazer River, of whom they stand in like awe.

Tsik'-tsik, or **Tchik'-tchik**, *n.* By onoma. *A wagon; a cart; a wheel.* Tsiktsik wayhut, *a wagon-road.*

Tsil'-tsil, or **Chil'-chil**, *n.* Chinook, ECHILCHIL. (Anderson.) *Buttons; the stars.*

Tsish, *v.* By onoma., in imitation of the sound of a grindstone. (Shaw.) Mamook tsish, *to sharpen.* Of local use.

Tsóle-pat, *n.* Klikatat. *A shot-pouch.* Of local use only.

Tso'-lo, *n.* Kalapuya. (Shaw.) *To wander in the dark; to lose one's way.* Used in the Willamette valley.

Tsugh, *n., v.* Chinook, idem. *A crack or split.* Mamook tsugh, *to split;* chahko tsugh, *to become split or cracked,* as by the heat of the sun; mamook tsugh illahie, is by some used instead of klugh, for *to plough.*

Tsuk. See CHUCK.

Tuk-a-mo'-nuk, or **Tak-a-mo'-nak**, *adj.* Chinook, ITAKAMONAK. *A hundred.* It is, like ten, combined with the digits; as, icht, moxt, klone takamonak, *one hundred, two hundred, three hundred,* &c. Hyas takamonak, *or* tahtlelum takamonak, *a thousand.*

Tuk'-wil-la, or **To'-kwil-la**, *n.* Kalapuya. *The hazel-nut; nuts generally.*

Tum'-tum, *n.* By onoma., from the pulsations of the heart. (Anderson.) *The heart; the will; opinion.* Mahsh tumtum, *to give orders;* mamook tumtum, *to make up one's mind;* mamook closhe tumtum, *to make friends or peace;* sick tumtum, *grief; jealousy;* moxt tumtum nika, *I am undecided,* i. e., *I have two wills.* *Q.* Kah nesika klatawa? *where shall we go?* *A.* Mika tumtum, *wherever you please; as you will.* Ikta mika tumtum? *what do you think?* Halo tumtum, *without a will of one's own,* as a child. The heart seems to be generally regarded as the seat of the mind or will.

Tum-wa'-ta, *n.* TUM, by onoma.; English, WATER. *A waterfall, cascade, or cataract.* Lewis and Clarke give TIMM as used by the Indians above the Dalles of the Columbia in directing them to the falls.

Tup'-shin, or **Tip'-sin**, *v.* Chihalis, TUPSHIN. *A needle.* Mamook tipsin, *to sew; to mend; to patch.*

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Túp-so, or **Tip'-so**, *n.* Chinook, TEPSO, *a leaf. Grass; leaves, fringe; feathers; fur.* Often but incorrectly employed for YAKSO, *hair;* tipso illahie, *prairie;* dely tipso, *hay.*

Ty'-ee, *n., adj.* Nootka, TAIYI; TYEE (Jewitt). *A chief.* Any thing of superior order. Saghalie tyee, *the Deity;* tyee salmon, *the spring salmon.* TOYON is given by some of the northwestern voyagers as the Eskimo appellation for *chief.*

Tzum, *n., adj.* Chinook, idem. *Mixed colors; spots or stripes; a mark or figure; writing; paint; painted.* Tzum sill, *printed calico;* tzum pehpa, *writing;* mamook tzum, *to write;* tzum illahie, *blazed or surveyed land.*

W.

Wagh, *v.* Chinook, WAKH. *To pour; to spill; to vomit.* Mamook wagh chuck, *pour out some water.*

Wake, *adv.* Nootka, WIK (Jewitt); Tokwaht, WEK. *No; not.*

Wa'-ki, *adv.* (Hale.) Chinook, WAKI. *To-morrow.* Not Jargon.

Wap'-pa-too, *n.* Quære u. d. *The root of the Sagitaria sagittifolia*, which forms an article of food; *the potato.* The word neither Chinook nor Chihalis, but is everywhere in common use

Wash, *v.* English, idem. Mamook wash, *to wash.*

Waum, *adj.* English, WARM. Hyas waum, *hot;* waum illahie, *summer;* mamook waum, *to heat;* waum-sick-cole-sick, *fever and ague.*

Wau'-wau, *v., n.* Nootka; Nittinat, WAWE. *To talk; speak; call; ask; tell; answer; talk or conversation.* Cultus wauwau, *idle talk; stuff; nonsense;* hyas wauwau, *to shout.*

Way'-hut, Hweh'-kut, or **Wee'-hut**, *n.* Chinook, WÉHUT, *a road;* Yakama, WIET, *far. A road or trail.* Tsik-tsik wayhut, *a wagon-road.* About Vancouver, on the Columbia, it is pronounced HWÉHKUT; on Puget Sound, WEEHUT.

Weght, *conj.* Chinook, idem. *Again; also; more.* Pe nika weght, *and I too;* pahtlatsh weght, *give me some more;* tenas weght, *a little more yet.*

Whim, *v.* Wasco. (Shaw.) *To fell.* Whim stick, *a fallen tree;* mamook whim okook stick, *fell that tree.* Also, *to throw*, in wrestling. Of local use only.

Win'-a-pie, *adv.* Nootka; Nittinat, WILAPI. *By-and-bye; presently; wait.* Of local use; the Chinook ALKI being more common.

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Wind, or **Win**, *n.* English, idem. *Wind.* The winds are often known by the country from which they blow; as, for instance, on the Columbia, an easterly is a Walla-walla wind; at the mouth of the river, a southerly is a Tilamooks wind, &c. *Breath.* Ex. Halo wind, *out of breath; dead.*

Y.

Yah'-hul, *n.* Chinook, YAKHUL; EBEKHOL. *A name.* Not in general use.

Yáh-ka, or **Yok'-ka**, *pron.* Chinook, YÁKA. *He; his; him; she; it,* &c.

Yah'-kis-ilt'h, *adj.* Chinook, YAKISILT'H. *Sharp.* Mr. Anderson gives as the original, "*cutting.*"

Yah'-wa, *adv.* Chinook, YAWÁKH. *There; thither; thence; beyond.*

Yah'-whul. See AYÁHWHUL.

Yak'-so, *n.* Chinook, idem. *The hair of the head; hair generally.*

Ya-kwah'-tin, or **Kwah'-tin**, *n.* Chinook and Clatsop, YAKWATIN. *The belly; the entrails.*

Yaub. See LEJAUB.

Yel'-a-kwat. See KALAKWAHTIE.

Yi'-em, *v., n.* Chihalis, YAIEM. *To relate; to tell a story; to confess to a priest; a story or tale.*

Youtl, *adj.* Quære Chihalis, EYUTLH; Nisqually, JUIL, *glad. Pleased; proud;* (of a horse), *spirited.* Hyas youtl yakka tum-tum, *his heart is very glad; he is much puffed up.*

Yoút-kut, *adj., n.* Chinook, YÚTLKUT. *Long* (in dimension); *length.*

Yoút-skut, or **Yutes'-kut**, *adj.* Chinook, YÚTSKUTA. *Short* (in dimension).

Y-salt'h, or **Ye-salt'h.** See E-SALT'H.

Yuk'-wa, *adv.* Chinook, YAKWÁ. *Here; hither; this side of; this way.* Yukwa kopa okook house, *this side of that house.*

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PART II.

ENGLISH-CHINOOK.

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PART II. ENGLISH—CHINOOK.

Above, *ságh-a-lie.*
Absolve, *mam'-ook stoh.*
Acorns, *káh-na-way.*
Across, *in'-a-ti.*
Afraid, *kwass.*
After, Afterwards, *kim'-ta.*
Again, *weght.*
All, *kon'-a-way.*
Alms, *e'-la-han*, or *e-lann'.*
Also, *weght.*
Although, *kégh-tchie.*
Always, *kwáh-ne-sum.*
American, *Boston.*
Amusement, *hee'-hes.*
And, *pee.*
Anger, Angry, *sol'-leks.*
Apple, *le pome.*
Apron, *kéh-su*, or *ki'-su.*
Arbutus uva ursi, *lahb.*
Arrive at, *ko.*
Arrow, *ka-li'-tan.*
As if, *káh-kwa spose.*
At, *ko'-pa.*
Aunt, *kwal'h.*
Awl, *shoes keep'-wot.*
Axe, *la-hash'.*

B.

Bad, *me-sáh-chie; pe-shuk'.*
Bag, *le sak.*
Ball, *le bal.*
Bargain, *máh-kook; húy-húy.*
Bark, *stick-skin.*
Barrel, *ta-mo'-litsh.*
Basket, *o'-pe-kwan.*
Beads, *ka-mo'-suk.*
Bear (black), *chet'-woot; its'-woot;* (grizzly), *si-am'.*
Beat, to, *kok'-shut.*
Beaver, *ee'-na.*
Because, *kéh-wa.*
Become, to, *cháh-ko.*
Bed, *bed.*
Before, *e'-lip*, or *el'-ip.*
Behind, *kim'-ta.*
Bell, *tin'-tin.*
Belly, *ya-kwáh-tin.*
Below, *kee'-kwil-lie.*
Belt, *la san-jel'.*
Berries, *o'-lil-lie; o'-lal-lie.*
Best, *e'-lip closhe.*
Bird, *kal-lak'-a-la.*
Biscuit, *le bis'-kwee.*
Bitter, *klihl.*
Black, *klale.*
Blackberries, *klik'-a-muks.*
Blanket, *pa-see'-sie.*
Blind, *ha'-lo se-áh-host.*
Blood, *pil-pil.*
Blow out, *mam'-ook poh.*
Blue (light), *spo'-oh.*
—— (dark), *klale.*
Blunder, to, *tsee'-pie.*
Board, *la plash.*
Boat, *boat.*
Bob-tailed; a bob-tailed horse, *sis'-ki-you.*

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Boil, to, *lip'-lip.*
Bone, *stone.*
Borrow, to, *a-yáh-whul.*
Bosom (female), *to-toosh.*
Both, *kun'-a-moxt.*
Bottle, *la-boo-ti'.*
Bow, *o'-pitl-kegh.*
Bowl, *oos'-kan.*
Box, *la ca-sett'.*
Bracelet, *klik'-wal-lie.*
Brave, *skoo'-kum tum'-tum.*
Bread, *le pan.*
Break, to, *kok'-shut.*
Breasts, *to-toosh'.*
Breech clout, *o'-poots sill.*
Bridle, *la bleed.*
Bright, *to-wágh.*
Broad, *kluk-ulh'.*
Broom, *bloom.*
Brother, *káhp-ho,* if elder than the speaker; *ow,* if younger. Male cousins the same.
Brother-in-law, *ek'-keh.*
Bucket, *ta-mo'-litsh.*
Buffalo, *moos'-moos.*
Bullet, *le bal; ka-li'-tan.*
Bundle, *kow.*
But, *pe.*
Butter, *to-toosh' la-kles'.*
Buttons, *tsil'-tsil.*
Buy, to, *máh-kook.*
By-and-by, *win'-a-pie.*

C.

Candle, *la shan-del'.*
Carrot, *la ca-lat'.*
Carry, to, *lo'-lo.*
Cart, *tsik'-tsik; chik'-chik.*
Cascade, *tum' wa-ter.*
Castrate, to, *mahsh stone.*
Cat, *puss'-puss.*
Cataract, *tum' wa-ter.*
Cattle, *moos'-moos.*
Certainly, *na-wit'-ka.*
Chain, *la shen; chik'a-min lope.*
Chair, *la shase.*
Cheat, to, *la-láh.*
Chicken, *la pool.*
Chief, *ty-ee'.*
Child, *ten'-as.*
Clams, *o'-na; luk'-at-chee; la-kwit'-chee.*
Clams, the large kind, *smet-ocks.*
Clear up, to, *cháh-ko klah.*
Cloth (cotton), *sail.*
Clouds, *smoke.*
Coat, *ca-po'.*
Coffee, *kau'-py.*
Cold, *cole; tshis.*
Comb, *comb.*
Comb, to, *mam'-ook comb.*
Come, to, *cháh-ko.*
Confess, to, *yi'-em.*
Conjuring, *ta-máh-no-us.*
Cook, to, *mam'-ook pi'-ah.*
Copper, *pil chik'-a-min.*
Cord, *ten'-as lope.*
Corn, *e-salt'h',* or *ye-salt'h'.*
Corral, *kul-lágh.*
Cotton goods, *sail.*
Cough, *hoh'-hoh.*
Count, to, *mam'-ook kwun'-nun*
Cousin, see brother and sister.
Coyote, *tal'-a-pus.*
Crab apple, *pow'-itsh.*
Cranberry, *so'-le-mie.*
Crazy, *pel'-ton.*
Cream-colored, *le clem.*
Crooked, *ki'-wa.*
Cross, *la clo-a'.*
Crow, *káh-kah.*

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Cry, to, *cly.*
Cup, *oos'-kan.*
Curly, *hunl'-kik.*
Cut, to, *tl'ko'-pe.*

D.

Dance, to, *tanse.*
Dark, darkness, *po'-lak-lie.*
Day, *sun.*
Dead, *mem'-a-loost.*
Deaf, *ik-poo'-ie kwil-lan.*
Dear, *hy'-as máh-kook.*
Deep, *klip.*
Deer, *mow'-itsh.*
Demon, *skoo'-kum.*
Devil, *di-aub'; yaub; le-jaub'.*
Different, *hul-o'-i-ma.*
Difficult, *kull.*
Dig, to, *mam'-ook il'-la-hie.*
Dime, *bit,* or *mit.*
Do, to, *mam'-ook.*
Doctor, *doc'-tin.*
Dog, *kam'-ooks.*
Dollar, *dol'-la,* or *táh-la.*
Door, *la po'te.*
Down stream, *mi'-mie.*
Drink, to, *muck'-a-muck.*
Drive, to, *kish'-kish.*
Drunk, *páht-lum.*
Dry, *de-ly'.*
Duck (Mallard), *kwéh-kweh; háht-haht.*
Dust, *po'-lal-lie.*

E.

Eagle, *chak'-chak.*
Ear, *kwo-lann'.*
Early, *ten'-as sun.*
Earn, to, *to'-lo*
Earth, *il'-la-hie.*
Eat, to, *muck'-a-muck.*
Egg, *le sap'; le zep'.*
Eight, *sto'-te-kin.*
Elk, *moo'-lock.*
Enclosure, *kul-lágh.*
English, Englishman, } *king chautsh.*
Enough, *hi-yu'; ko-pet'.*
Entrails, *ki-yágh.*
Evening, *ten'-as po'-lak-lie.*
Every, *kon'-a-way.*
Exchange, *húy-huy.*
Eyes, *se-áh-host.*

F.

Face, *se-áh-host.*
Faded, *spo'-oh.*
Falsehood, *klim-in'-a-whit.*
Far, *si-áh.*
Fast (quick), *hy-ak'.*
Fast (tight), *kwutl.*
Fasten, to, *kow.*
Fat, *glease.*
Father, *pa'-pa.*
Fathom, *il'-lan.*
Fear, *kwass.*
Fell, to (as a tree), *mam'-ook whim.*
Fence, *kul-lágh.*
Fetch, to, *mam'-ook cháh-ko.*
Fever, *waum sick.*
Few, *ten'-as.*
Fight, to, *mam'-ook sol'-leks.*
Fight, with fists, *mam'-ook puk'-puk.*
Figured (as calico), *tzum.*
File, *la leem.*
Fill, to, *mam'-ook pahtl.*
Find, to, *klap.*

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Fingers, *le doo.*
Fire, *pi'-ah; o-la-pits'-ki.*
First, *e'-lip*, or *el'-ip.*
Fish, *pish.*
Fish-hook, *ik'-kik.*
Five, *kwin'-num.*
Flea, *so'-pen e'-na-poo; cho'-tub.*
Flesh, *itl'-wil-lie.*
Flint, *kil-it'-sut.*
Flour, *sap'-o-lill.*
Fly, to, *ka-wak'.*
Fog, *smoke.*
Food, *muck'-a-muck.*
Fool, *pel'-ton.*
Foolish, *pel'-ton.*
Foot, *le-pee'.*
Forever, *kwáh-ne-sum.*
Forget, to, *máh-lie.*
Fork, *la poo-shet'.*
Formerly, *áhn-kut-te*, or *áhn-kot-tie.*
Four, *lak'-it*, or *lok'-it.*
Fowl, *la pool.*
French, Frenchman, *pa-si'-ooks.*
Friend, *sikhs*, or *shikhs.*
Frog, *shwáh-kuk.*
Fry, to, *mam'-ook la po-el'.*
Frying-pan, *la po-el'.*
Full, *pahtl.*
Fundament, *o'-poots.*

G.

Gallop, to, *kwa-lal'-kwa-lal'.*
Gather, to, *ho'-ku-melh.*
Get, to, *is'-kum.*
Get out, *mahsh.*
Get up, *get-up'*, or *ket-op'.*
Ghost, *skoo'-kum.*
Gift, *cul'-tus pot'-latch.*
Give, to, *pot'-latch.*
Glad, *kwann.*
Go, to, *klat'-a-wa.*
God, *ságh-a-lie ty-ee'.*
Gold, *pil chik'-a-min.*
Good, *klose*, or *kloshe.*
Good-bye, *kla-how'-ya.*
Goods, *ik'-tah.*
Goose, *whuy'-whuy; kal-ak-a-láh-ma.*
Grandfather, *chope.*
Grandmother, *chitsh.*
Grease, *la-kles'; glease.*
Green, *pe-chugh'.*
Grey; a grey horse, *le gley.*
Grizzly bear, *si-am'.*
Ground, *il'-la-hie.*
Gun; musket, *suk'-wa-lal.*

H.

Hair, *yak'-so.*
Half, *sit'-kum.*
Hammer, *le máh-to.*
Hand, *le máh.*
Hand (game of), *it'-lo-kum.*
Handkerchief, *kak'-at-shum.*
Hard, *kull.*
Hare, *kwit'-shud-ie.*
Harrow, to, *mam'-ook comb il'-la-hie.*
Hat, *se-áh-po; se-áh-pult.*
Haul, *haul.*
Hazel-nuts, *tuk'-wil-la.*
He, his, *yáh-ka.*
Head, *la tet.*
Heart, *tum'-tum.*
Heaven, *ságh-il-lie il'-la-hie.*
Heavy, *till.*
Help, to, *mam'-ook e-lanx'.*
Here, *yuk'-wa.*

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Hermaphrodite, *bur'-dash.*
Hide, to, *ip'-soot.*
High, *ságh-a-lie.*
Hit, to, *kwul'h.*
Hoe, *la pe-osh'.*
Hog, *co'-sho.*
Hole, *kla-whap'.*
Holiday, *sunday.*
Horn, *stone.*
Horse, *kiu'-a-tan.*
House, *house.*
How, *káh-ta.*
How are you, *kla-how'-ya.*
How many, *kun'-sih; kun'-juk.*
Hundred, *tuk-a-mo'-nuk.*
Hungry, *o'-lo.*
Hurry, *howh; hy-ak'.*

I.

I, *ni-ka.*
If, *spose.*
In, *ko'-pa.*
Indian, *si'-wash.*
In shore, *máht-wil-lie.*
Iron, *chik'-a-min.*
It, *yáh-ka.*

J.

Jealous, *sick tum'-tum.*
Jump, to, *so'-pe-na.*

K.

Kam-ass root, *la'-ka-mass.*
Kettle, *ket-ling.*
Kick, to, *chuk'-kin.*
Kiss, to kiss, *be'-be.*
Knife, *o'-pit-sah.*
Knock, to, *ko'-ko.*
Knotty, *kunl'-kih.*
Know, to, *kum'-tuks.*

L.

Lame, *klook te-áh-wit.*
Lamprey eel, *skwak'-wal.*
Language, *la lang.*
Large, *hy-as'.*
Lately, *chee.*
Laughter, *hee'-hee.*
Lazy, *lazy.*
Leap, to, *so'-pe-na.*
Leaf, *tup'-so*, or *tip'-so.*
Lean, to, *lagh.*
Leave, to, *mahsh.*
Leave off, to, *ko-pet'.*
Leg, *te-áh-wit.*
Leggings, *mi-tass'.*
Lend, to, *a-yáh-whul.*
Lick, to, *klak'-wun.*
Lie, to, *klim-in'-a-whit.*
Like, *káh-kwa.*
Like, to, *tik-égh.*
Little, *ten'-as.*
Long, *youtl'-kut.*
Long ago, *áhn-kut-te*, or *áhn-kot-tie.*
Look, to, *nan'-itsh.*
Look here! *nah.*
Look out! *klose nan'-itsh.*
Looking-glass, *she-lok'-um.*
Loose, *stoh.*
Lose the way, to, *tso'-lo; tsee-pie' way-hut.*
Louse, *e'-na-poo*, or *in'-a-poo.*
Love, to, *tik-égh.*

M.

Magic, *ta-máh-no-us.*

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Make, to, *mam'-ook.*
Man, *man.*
Many, *hy-iu'.*
Marry, to, *mal-i-éh.*
Mass (Ceremony of), *la messe.*
Mast, *ship stick.*
Mat, *klis'-kwiss.*
Mattock, *la pe-osh'.*
Measure, to, *tah'-nim.*
Meat, *itl'-wil-lie.*
Medicine, *la mes'-tin.*
Mend, to, *mam'-ook tip'-shin.*
Menstruate, to, *mahsh pil'-pil.*
Metal, metallic, *chik'-a-min.*
Middle, the, *kat'-suk,* or *kot'-suk.*
Midnight, *sit'-kum po'-lak-lie.*
Milk, *to-toosh'.*
Mill, *moo'-la.*
Mind, the, *tum'-tum.*
Miss, to, *tsee'-pie.*
Mistake, to, *tsee'-pie.*
Moccasins, *skin-shoes.*
Molasses, *mel-ass'.*
Money, *chik'-a-min.*
Month, *moon.*
Moon, *moon.*
More, *weght.*
Mosquito, *mel'-a-kwa.*
Mother, *mama; na'-ah.*
Mountain, *la mon'-ti.*
Mouse, *hool'-hool.*
Mouth, *la boos.*
Much, *hy-iu'.*
Mule, *le mel.*
Musical Instrument, *tin'-tin.*
Musket, *musket.*
Mussels, *to'-luks.*
My, mine, *ni'-ka.*

N.

Nails, *le cloo.*
Name, *nem; yah-hul.*
Near, *wake si-áh.*
Neck, *le cou.*
Needle, *keep'-wot.*
New, *chee.*
Night, *po'-lak-lie.*
Nine, *kwaist,* or *kweest.*
No, not, *wake.*
Noise, *la tlah.*
None, *ha'-lo.*
Nonsense, *cul'-tus wau'-wau.*
Noon, *sit-kum sun.*
Nose, *nose.*
Notwithstanding, *kégh-tchie*
Now, *al'-ta.*
Numerals—
1, *ikt.*
2, *mokst.*
3, *klone.*
4, *lakit.*
5, *kwinnum.*
6, *taghum.*
7, *sinnamokst.*
8, *stotekin.*
9, *kwaist.*
10, *tahtlelum.*
11, *tahtlelum pe ikt*
20, *mokst tahtlelum.*
100, *ikt takamonuk.*
Nuts, *tuk'-wil-la.*

O.

Oak, *kull stick.*
Oar, *la lahm; la lum.*
Oats, *la wen.*
Off, *klak.*
Off shore, *máht-lin-nie*

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Oil, *glease.*
Old, *o'-le-man.*
Old man, *o'-le-man.*
Old woman, *lam'-mi-eh.*
One, *ikt.*
One-eyed, *ikt se-áh-host.*
Open, *háh-lakl.*
Opposite to, *in'-a-ti.*
Or, *pe.*
Order, to, *mahsh tum'-tum.*
Other, *hul-o'-i-ma.*
Otter (land), *ne-mam'-ooks.*
Our, *ne-si'-ka.*
Out doors, *klágh-a-nie.*
Ox, *moos'-moos.*
Oyster, *chet'-lo*, or *jet'-lo; klógh-klogh.*

P.

Paddle, a, *is'-ick.*
Paddle, to, *mam'-ook is'-ick.*
Paint, *pent.*
Paint, to, *mam'-ook pent.*
Paper, *péh-pah.*
Peas, *le pwau.*
People, *til'-i-kum.*
Perhaps, *klo-nas'.*
Petticoat, *kal-a-kwah'-tie.*
Piebald, *le kye.*
Pin, *kwek'-wi-ens.*
Pipe, *la peep.*
Pitch, *la gome.*
Plate, *la si-et'.*
Pleased, *youtl.*
Plough, *le shal-loo'.*
Plough, to, *klugh il'-la-hie.*
Pole, *la pehsh.*
Poor, *kla-how'-yum; ha'-lo ik'-ta.*
Pork, *co'-sho.*
Posteriors, *o'-poots.*
Potato, *wap'-pa-too.*
Pour, to, *wagh.*
Powder, *po'-lal-lie.*
Prairie wolf, *tal'-a-pus.*
Presently, *al'-kie; win'-a-pie*
Pretty, *to'ke-tie.*
Priest, *le plet.*
Proud, *youtl; kwetl'h.*
Provided that, *spose.*
Pull, *haul.*

Q.

Quarter, *ten'-as sit'-kum.*
Quarter (of a dollar), *kwah-t*
Quick, *hy-ak'.*
Quills, *te-péh.*

R.

Rabbit, *kwit'-shad-ie.*
Rain, *snass.*
Rattle, *shugh.*
Rattlesnake, *shugho'-poots.*
Razor fish, *o'-na.*
Reach, *ko.*
Red, *pil.*
Relate, to, *yi'-em.*
Return, to, *kel'-i-pi.*
Ribbon, *le lo'-ba.*
Rice, *lice.*
Rifle, *cal'-li-peen.*
Ring, a, *kwéo-kwéo.*
Ripe, *pi'-ah.*
River, *chuck.*
Road, *way'-hut.*
Roan colored, *san'-de-lie.*
Roast, *mam'-ook la pel-lah*
Rock, *stone.*
Rope, *lope.*

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Rotten, *poo'-lie.*
Round, *lo'-lo.*
Rudder, *boat o'-poots.*
Rum, *lum.*

S.

Sack, *le sak.*
Saddle, *la sell.*
Saddle housings, *le pish'-e-mo.*
Sail, *sail.*
Sailor, *ship'-man.*
Salmon, *salmon.*
Salt, *salt.*
Sand, *po'-lal-lie.*
Sash, *la san-jel'.*
Saw, *la gwin; la scie.*
Say, to, *wau'-wau.*
Scissors, *le see'-zo.*
Sea, *salt-chuck.*
Seal, *ol'-hi-yu si'-wash co'-sho.*
See, to, *nan'-itsh.*
Sell, to, *máh-kook.*
Seven, *sin'-a-moxt.*
Sew, to, *mam'-ook tip'-shin.*
Shake, to, *to-to; hul'-lel.*
Shame, *shem.*
Sharp, *yáh-kis-ill'h.*
Sharpen, to, *mam'-ook tsish.*
She, her, *yah-ka.*
Sheep, *le moo'-to.*
Shell money (the small size), *coop-coop;* (the large), *hy-kwa.*
Shingle, *le-báh-do.*
Shining, *to-wágh.*
Ship, *ship.*
Shirt, *shut.*
Shoes, *shoes.*
Shoot, to, *mam'-ook poo.*
Short, *yútes-kut.*
Shot, *shot; ten'-as le bal.*
Shot pouch, *ka-li-tun le-sac'; tsole'-pat.*
Shout, to, *hy'-as wau'-wau.*
Shovel, *la pell.*
Shut, to, *ik-poo'-ie.*
Sick, *sick.*
Sift, to, *to-to.*
Silk, *la sway.*
Silver, *t'kope chik'-a-min.*
Similar, *káh-kwa.*
Since, *kim-ta.*
Sing, to, *shan'-tie.*
Sister, *káhp-ho*, if older than the speaker; *ats*, if younger.
Sit, to, *mit'-lite.*
Six, *tógh-um.*
Skin, *skin.*
Skunk, *hum o'-poots; piu'-piu; skub'-e-you.*
Sky, *koo'-sagh.*
Slave, *e-li'-te; mist'-shi-mus.*
Sleep, *moo'-sum.*
Slowly, *kláh-wa.*
Small, *ten'-as.*
Smell, a, *humm.*
Smoke, *smoke.*
Snake, *o'-luk.*
Snow, *snow; cole snass.*
Soap, *soap.*
Soft, *klim'-min.*
Sorrel colored, a sorrel horse, *le blau.*
Sorry, *sick tum'-tum.*
Sour, *kwates.*
Spade, *la pell.*
Speak, to, *wau'-wau.*
Spill, to, *wagh.*
Spirits, *lum.*
Split, *tsugh.*
Split, to, *mam'-ook tsugh.*

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Spectacles, *dol'-la se-ágh-ost*, or *lak-it se-agh-ost*.
Spit, to, *mam'-ook toh*.
Split, to become, *cháh-ko tsugh*.
Spoon, *spoon*.
Spotted, *le kye; tsum*.
Spurs, *le see'-blo*.
Squirrel, *skwis'-kwis*.
Stab, to, *klem'-a-hun*.
Stand, to, *mit'-whit*.
Stars, *tsil'-tsil*.
Stay, to, *mit'-lite*.
Steal, to, *kap-su-al-la*.
Steam, *smoke*.
Steamer, *pi'-ah ship*.
Stick, a, *stick*.
Stink, a, *piú-piú; humm*.
Stirrup, *sit'-lay*.
Stockings, *stock'-en; kush-is'*.
Stone, *stone*.
Stop, to, *ko-pet'*.
Store, *máh-kook house*.
Story, *eh-káh-nam*.
Straight, *de-láte*, or *de-let'; si'-pah*.
Strawberries, *a-mo'-te*.
Strong, *skoo'-kum*.
Sturgeon, *stutch'-un*.
Sugar, *le sook; shu'-gah; shu'-kwa*.
Summer, *waum il'-la-hie*.
Sun, *sun; óte-lagh*.
Sunday, *sunday*.
Sunset, *klip sun*.
Suppose, *spose*.
Swan, *káh-loke*.
Sweep, to, *mam'-ook bloom*.
Sweet, *tsee*.
Swim, *sit'-shum*

T.

Table, *la tahb*.
Tail, *o'-poots*.
Take, to, *is'-kum*.
Take care! *klose nan'-itsh*.
Take off, or **out**, *mam'-ook klak; mahsh*.
Tale, or **story**, *yi'-em; eh-káh-nam*.
Talk, to, *wau'-wau*.
Tame, *kwass*.
Tea, *tea*.
Teach, to, *mam'-ook kum'-tuks*.
Tear, to, *klugh*.
Teeth, *le táh*.
Tell, to, *wau'-wau*.
Ten, *táht-le-lum*.
Testicles, *stone*.
Thank you, *máh-sie*.
That, *o'-koke*.
That way, *yáh-wa*.
There, *yáh-wa; ko-páh*.
They, *klas'-ka*.
Thick (as molasses), *pit'-lilh*.
Thin (as a board), *p'chih; pe-what'-tie*.
Thing, *ik'-tah*.
This, *o'-koke*.
This way, *yuk'-wa*.
Thou, thy, thine, *mi'-ka*.
Thread, *kla-pite*.
Three, *klone*.
Throw away, *mahsh*.
Tide, see *chuck*.
Tie, to, *kow*.
Tight, *kwutl*.
Tinware, *ma-láh*.
Tip, to, *lagh*.
Tired, *till*.
To, towards, *ko'-pa*.

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Tobacco, *ki'-nootl; ki'-noos.*
To-morrow, *to-mol'-la.*
Tongue, *la lang.*
Trail, *way'-hut.*
Trap, *la piége.*
Tree, *stick.*
Tree, fallen, *whim stick.*
Trot, to, *téh-teh.*
Trowsers, *sa-kol'-eks.*
True, *de-láte.*
Truth, *de-láte wau'-wau.*
Tub, *ta-mo'-litsh.*
Twine, *ten'-as lope; kla-pits.*
Two, twice, *mokst.*

U.

Uncle, *tot.*
Under, *kee'-kwil-lie.*
Understand, to, *kum'-tuks.*
Unhappy, *sick tum'-tum.*
Untamed, *le-mo'-lo.*
Untie, to, *mam'-ook stoh; mahsh kow.*
Up, *ságh-a-lie.*
Upset, to, *kel'-i-pi.*
Us, *ne-si'-ka.*

V.

Venereal, the, *pi'-ah sick.*
Venison, *mow'-itsh.*
Very, *hy-as'.*
Vessel, *ship.*
Vest, *la west.*
Vomit, to, *wagh.*

W.

Wagon, *tsik'-tsik; chik'-chik.*
Wander, to, *tso'-lo.*
Want, to, *tik-égh.*
Warm, *waum.*
Wash, to, *mam'-ook wash.*
Watch, a, *tik'-tik.*
Water, *chuck.*
Waterfall, *tum'-water.*
We, *ne-si'-ka.*
Weigh, to, *mam'-ook till.*
Wet, *pahtl chuck.*
Whale, *eh'-ko-lie; kwáh-nice, kwad'-dis.*
What, *ik'-tah.*
Wheat, *sap'-o-lill.*
Wheel, *tsik'-tsik; chik'-chik.*
When, *kan'-sih; kun-juk.*
Where, *kah.*
Whip, *le whet.*
White, *t'kope.*
Who, *klak'-sta.*
Whole, *lo'-lo.*
Why, *káh-ta.*
Wicked, *me-sáh-chie.*
Wide, *kluk-ulh'.*
Wild, *le mo'-lo.*
Will, the, *tum'-tum.*
Willow, *ee'-nastick.*
Win, to, *to'-lo.*
Wind, *wind.*
Winter, *cole il'-la-hie.*
Wipe, to, *klak'-wun.*
Wire, *chik'-a-min lope.*
Wish, to, *tik-égh.*
With, *ko'-pa.*
Without, *ka'-lo.*
Wolf, *le-loo'.*
Woman, *klootsh'-man.*
Woman (old), *lam'-mi-eh.*
Wood, wooden, *stick.*
Work, to, *mam'-ook.*
Worn out, *o'-le-man.*
Worthless, *cul'-tus.*

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Wound, to, *klem'-a-hun.*
Write, to, *mam'-ook péh-pah; mam'-ook tzum.*
Writing, *tzum.*

Y.

Year, *ikt cole.*
Yellow, *kaw'-ka-wak.*
Yes, *áh-ha; e-éh.*
Yes indeed, *na-wit'-ka.*
Yesterday, *táhl-kie; táhl-kie sun.*
You, your, yours, *me-si'-ka.*
Young, *ten'-as.*

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THE LORD'S PRAYER IN JARGON.

Nesika papa klaksta mitlite kopa saghalie, kloshe kopa nesika
Our father who stayeth in the above, good in our

tumtum mika nem; kloshe mika tyee kopa konaway tilikum;
hearts (be) thy name; good thou chief among all people;

kloshe mika tumtum kopa illahie, kahkwa kopa saghalie. Potlatch
good thy will upon earth as in the above. Give

konaway sun nesika muckamuck. Spose nesika mamook masahchie,
every day our food. If we do ill,

wake mika hyas solleks, pe spose klaksta masahchie kopa
(be) not thou very angry, and if any one evil towards

nesika, wake nesika solleks kopa klaska. Mahsh siah kopa
us not we angry towards them. Send away far from

nesaika konaway masahchie.
us all evil.

Kloshe kahkwa.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.
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INSTRUCTIONS

FOR RESEARCH RELATIVE TO THE

ETHNOLOGY AND PHILOLOGY

OF

AMERICA.

PREPARED FOR THE SMITHSONIAN INSTITUTION.

BY

GEORGE GIBBS.

WASHINGTON:
SMITHSONIAN INSTITUTION:
MARCH, 1863.

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INSTRUCTIONS

RELATIVE TO THE

ETHNOLOGY AND PHILOLOGY OF AMERICA.

INTRODUCTORY REMARKS.

THE Smithsonian Institution is desirous of extending and completing its collections of facts and materials relative to the Ethnology, Archæology, and Philology of the races of mankind inhabiting, either now or at any previous period, the continent of America, and earnestly solicits the coöperation in this object of all officers of the United States government, and travellers, or residents who may have it in their power to render any assistance.

JOSEPH HENRY,
Secretary S. I.

SMITHSONIAN INSTITUTION,
WASHINGTON, March 1, 1863.

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ETHNOLOGY.

CRANIA.—Among the first of the desiderata of the Smithsonian Institution, is a full series of the skulls of American Indians.

The jealousy with which they guard the remains of their friends renders such a collection in most cases a difficult task, but there are others in which these objects can be procured without offence. Numerous tribes have become extinct, or have removed from their former abodes; the victims of war are often left where they fall; and the bones of the friendless and of slaves are neglected. Where, without offence to the living, acquisitions of this kind can be made, they will be gladly received as an important contribution to our knowledge of the race.

Various methods of disposing of the dead have prevailed among different tribes, as burning, burial, deposit in caves, in lodges, beneath piles of stone, and in wooden sepulchres erected above-ground, placing on scaffolds or in canoes, and attaching to the trunks of trees. In many instances the bones, after a season, are collected together and brought into a common cemetery. Where the first-mentioned form, that of burning, is followed, we must, of course, look to chance for the preservation of the remains. This method is, however, more rare than the others.

It is requisite, for the purpose of arriving at particular results, that the most positive determination be made of the nation or tribe to which a skull belongs. In extensive prairie countries, hunted over or traversed by various tribes, or where, as on the Pacific coast, several tribes and even stocks inhabit a district of limited extent, this is often difficult, or even impossible. Unless, therefore, information of a direct nature is obtained, the collector should be guarded in assigning absolute nationality to his specimens. It will be better to state accurately the locality whence they are derived, and the owners or frequenters of the neighborhood, to one of which they are likely to belong. Where several specimens are collected, each should be numbered to correspond with a catalogue in which the above points are mentioned; as also whether it was found in a grave or other place of deposit,

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the character of the ornaments and utensils placed with it, and whether it was in its original place or had been combined with others. Finally, it should be ascertained whether the tomb was that of existing or recent inhabitants of the country, or of more ancient date,—such, for example, as the mound-builders of the Ohio; and, in this latter case, if the remains are those of the original inhabitant, or have been since deposited. In this inquiry the character of the articles buried with the body will often furnish a clue. The same precaution should be adopted where tribes have been removed from their native regions to a different locality. In short, where any doubt exists in the mind of the collector, all those circumstances should be examined into which in the absence of direct testimony, will facilitate a conclusion as to origin.

It may be mentioned in this connection, that among some nations, it is the custom to marry out of the tribe, as a matter of policy. Skulls of women found in the cemeteries of one of these might therefore very probably belong to an adjoining tribe, and, possibly, to one of an entirely different stock. In such cases, too, there can be no certainty that the men themselves are of the pure blood of one race, and it is, therefore, important to ascertain if this custom exists. Among those tribes where flattening or altering the head is common to *both* sexes, particular suspicion should attach to any having the skull unaltered. This process is usually a mark of rank, or at least of freedom, and an unaltered skull, if found in a burial-place or well-marked receptacle, may almost be assumed to be that of a stranger; if neglected, it is probably that of a slave. But as slaves were often buried with their owners, even this is not a positive conclusion. Among some of the Pacific tribes, however, compression of the head is confined to females, or is, at any rate, only carried to any considerable extent among them. Slaves are sometimes of the same tribe with their owners, but they are more frequently purchased from others; and it should be noted that on the Pacific the course of the trade has been from south to north.

In order to ascertain whether differences of form exist among different stocks, the accumulation of as many specimens as possible of each tribe is desirable, and duplicates moreover afford the means of extending the collection by exchange.

Skulls which have been altered in shape possess a certain interest in themselves, though they are in other respects disadvantageous for comparison. The practice, in different forms, formerly existed more widely than at present, several tribes in the southern States, as the Natchez, &c., having been addicted to it. Two methods are still

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employed in North America: that of flattening the head by pressure on the forehead, as practised among the Chinooks and other tribes in Oregon and Washington Territory, and that of elongating it, peculiar to a few on the northern end of Vancouver island.

SPECIMENS OF ART, ETC.—Another department to which the Institution wishes to direct the attention of collectors, is that of the weapons, implements, and utensils, the various manufactures, ornaments, dresses, &c., of the Indian tribes.

Such a collection may naturally be arranged under three periods. The first, that of the races which had already passed away before the discovery of the continent by Europeans, or whose extinction may be considered as coeval with that event; next, of the tribes who have disappeared with the settlement of the Atlantic States and the country between the Alleghanies and the Mississippi; and finally, that of the present time, or that of the yet existing nations, confined to the northern and western portions of the continent and to Mexico.

It is among the last that the greatest variety exists, and of which it is especially important to make immediate collections, as many articles are of a perishable nature, and the tribes themselves are passing away or exchanging their own manufactures for those of the white race. It is hardly necessary to specify any as of particular interest, for almost every thing has its value in giving completeness to a collection. Among the most noticeable, however, are dresses and ornaments, bows and arrows, lances, war-clubs, knives, and weapons of all kinds, saddles with their furniture, models of lodges, parflesh packing covers and bags, cradles, mats, baskets of all sorts, gambling implements, models of canoes (as nearly as possible in their true proportions), paddles, fish-hooks and nets, fish-spears and gigs, pottery, pipes, the carvings in wood and stone of the Pacific coast Indians, and the wax and clay models of those of Mexico, tools used in dressing skins and in other manufactures, metates or stone mortars, &c., &c.

In making these collections, care should be taken to specify the tribes from which they are obtained, and where any doubt may exist, the particular use to which each is applied. Thus, for instance, among the Californians, one form of basket is used for holding water; another for sweeping the seeds from various plants and grasses; a third, as their receptacle during the process of collection; a fourth, for storage; still another, in which to pound the seeds; again, one to boil the porridge made from the flour; and finally, others as dishes from which the preparation is eaten. It will also be desirable to ascertain the Indian names given to each article.

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Of the second class, the remains are also numerous, and are scattered through all the States east of the Mississippi, in the form of axes, arrow-heads, sinkers for nets, fleshing chisels, and other implements of stone, and in some cases fragments of rude pottery.

To the first class belong the only *antiquities* of America, and these are of various descriptions. They include the tools found in the northern copper-mines; the articles inclosed in the mounds of Ohio and elsewhere; the images common in Kentucky and Tennessee, indicating, among other things, the worship of the Phallus; pottery, the fragments of which are abundant in Florida, the Gulf States, and on the Gila, connecting an extinct with an existing art; and especially those specimens frequently disinterred in the Mexican States, belonging to the era of Aztec or Toltecan civilization. It is especially important to ascertain the antiquity of these by careful observation of the circumstances under which they are discovered, in order not to confound ancient with modern utensils.

To this class also belong those articles found under conditions which connect archæology with geology, and which may be classed as follows:

1. The contents of shell beds of ancient date found on the seacoasts and bays, often deeply covered with soil and overgrown with trees; among which, besides the shells themselves, implements of stone, bones of fish, animals, and birds used for food, are frequently met with. The examination of these collections in Denmark and other countries of northern Europe has led to the discovery of remains belonging to a period when a people having no other implements than those of stone or bone occupied the coast prior to the settlement there of the present race. It is possible that a similar investigation in America may carry us back to a very remote period in aboriginal history.

2. Human remains, or implements of human manufacture, bones of animals bearing the marks of tools or of subjection to fire, found in caves beneath deposits of earth, and more especially of stalagmite or stony material formed by droppings from the roof.

3. Spear and arrow heads, or other weapons, and evidences of fire discovered in connection with bones of extinct animals, such as the mammoth, fossil elephant, &c., among superficial deposits, such as salt-licks, &c.

4. Implements of the same description found in deposits of sand and gravel, or other like material, exposed in bluffs or steep banks, such as have recently attracted the attention of European geologists.

In all these cases the utmost care should be taken to ascertain with

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absolute certainty the true relations of these objects. In the case of the shell-banks, the largest trees, where any exist, should, if practicable, be cut down and the annual rings counted. Next, the depth of the superincumbent deposit of earth should be measured, and its character noted, whether of gravel, sand, or decomposed vegetable matter; as also whether it has been stratified by the action of water. Next, the thickness of the shell-bed should be ascertained, and the height of its base above present high-water mark; as also whether it exhibit any marks of stratification. Finally, the face of the bed having been uncovered, a thorough examination should be made, commencing at the top and carefully preserving all objects which exhibits signs of human art, and noting the depth in the deposit at which they were discovered. Specimens of each species of shell should be collected, and all bones or fragments of them saved. Evidences of the use of fire should be watched for and recorded.

In the search of caverns, the same system should be followed. First, the floor should be inspected for any recent remains either of men or animals; next, the superficial earth should be carefully removed over a considerable space and thoroughly examined at various depths, the results, if any, being kept separate, and marked accordingly. Where a stalagmitic deposit, such as is common in limestone caverns, forms the floor, it must be broken up and its thickness measured. The underlying materials should then be cautiously removed and sorted over, each layer being kept by itself; and where any remains are discovered, the utmost precaution should be taken to determine their actual circumstances. If, for instance, they are bones of men, it should be ascertained whether the skeleton is entire and in a natural position, indicative of having been buried there, or scattered, as also its position relative to any other remains, whether under or over them; if of animals, whether they exhibit the marks of tools, and above all, evidences of the employment of fire. Every fragment of bone or other evidence of animal life should be preserved and marked with the order of its succession in depth.

The same precautions should be taken in the other cases mentioned, the conditions under which the objects are found, and the depth and character of covering of each being noted, and full sets of specimens sent for examination.

Besides collecting the articles heretofore mentioned, persons able to make the investigations, are invited to report the information sought in the following paper prepared by the late Prof. W. W. Turner.

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Hints for Ethnological Inquiry.

Inquiries of this description have the two-fold object of ascertaining the present condition of these tribes and their past history. Although both branches of the investigation have of course a mutual bearing upon each other, yet the former has more of a practical, the latter more of a scientific character; the former is comparatively easy, the latter environed with difficulties. In examining into the numbers, physical and mental characteristics, and actual condition of the Indian tribes, we are accumulating data for beneficent, legislative, and philanthropic action in their behalf. The work, moreover, is a mere matter of observation, to be accomplished with the requisite expenditure of time and labor to almost any degree of minute accuracy that may be desired. On the contrary, any reliable knowledge of ante-Columbian events, that is now attainable, can, from the nature of things, be only general in its character, and the fruit of laborious induction from the comparison of many diverse particulars. As none of the tribes of this continent, not even the most advanced, ever arrived at the grand and fruitful idea of an alphabetic character for commemorating their thoughts and deeds, almost their entire history previous to the advent of Europeans is left a mysterious blank. To ascertain, if possible, the origin of the aboriginal population of this portion of our globe, to trace the migrations and conquests of the various nations that composed it from one part of the continent to another, to disclose their superstitions, their manners and customs, their knowledge of the arts of war and peace—in short, to place before us a moving panorama of America in the olden time—such is the purpose which the scientific ethnologist has in view, and to accomplish which he neglects no source of information that promises to cast even a single ray of light into the obscurity with which the subject is surrounded.

Names of tribes.—In addition to the name by which a tribe calls itself, it is desirable to ascertain those which are given to it by surrounding tribes, together with the literal meaning of each name.

Geographical position.—Give as accurately as may be the size of the territory, whether mainland or island, belonging to each tribe; its climate, soil, and general character; also its animal, vegetable, and mineral productions.

Number.—What is the number of individuals in the tribe? State, if you can, the number of adult males. females, and children respec-

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tively. Has the number of the tribe increased or diminished to any remarkable extent; and if so, to what cause is the change owing?

Physical constitution.—It is essential to notice the general stature of the people, the form of their bodies generally, and the proportions of their limbs; the form of the skull and the facial angle; the features; have these any thing which distinguishes them from other people? What are the color and texture of their skin and hair? What beard have they? What is the color of their eyes? Are they generally handsome or ugly? Have they much or but little muscular strength? Are they remarkable for the peculiar perfection of any of their organs, as that of sight, of hearing, of smelling; or for any corporeal faculties, as speed in running, facility of climbing, of diving and remaining long under water, or for nimbleness and dexterity, or the reverse? What is the ordinary duration of life among them? It is highly desirable, also, that photographs should be taken of individuals of each tribe.

Picture-writing, etc.—A full description is desirable of any modes that the natives may practise of recording events or communicating ideas by sensible signs, especially paintings or picture-writings, however rude, whether on pieces of bark or skin, on their dwellings or implements, on rocks, &c. When the object itself containing the record cannot be secured and brought away, exact drawings of the figures should be taken, colored after the originals. Every circumstance respecting the locality and people among whom found should be noted down, together with the interpretations of the natives (endeavoring in all cases to have the independent testimony of more than one), when attainable.

Dress.—State the materials, colors, and fashion of their dresses and ornaments. Do they paint themselves; and if so, with what materials? Do they paint variously on different occasions, as on festivals and before going to war? Give specimens of the figures they employ, especially of any that may be distinctive of the tribe or band. The same of tattooing, if practised. Some tribes of the northwest make large incisions in the under lip, others flatten the heads of their infants by compression; all such things should be observed and accurately noted respecting each tribe.

Food.—Describe the materials of which it consists, with the mode of procuring it, as by hunting, fishing, collecting roots, berries, &c. Do they practise agriculture at all; if so, to what extent; and what grains, roots, etc., do they cultivate? Do they rear any domestic animals? Do they make any stimulating drinks of their own; and are they fond of tobacco or any other narcotic?

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Dwellings.—Are these permanent or movable; of what materials are they constructed, and how? Are they entirely above or partially under ground; what is their interior arrangement? Drawings of both exteriors and interiors should be made, so as to give an accurate idea of their peculiarities. On whom does the labor of construction fall, the men or the women; and in case of migration, is the entire structure removed, or only the outside covering? When a number of dwellings are placed near each other, as when a tribe encamp together on a spot, is any regular mode of arrangement observed? Have they any buildings set apart for public purposes, as business, amusement, or worship; and how are they constructed?

Arts.—An exceedingly interesting branch of inquiry, and one too often overlooked or but imperfectly attended to by travellers, is pre sented to us in the primitive industrial arts of the aborigines. Of what materials is the pottery composed; is any of it turned on a wheel; how are the materials compounded; is the ware burned completely or partially; is it glazed or not? How is it ornamented? Have they any utensils of stone; and if so, what is the material? Of what materials are their arrow and spear heads manufactured, and what is the process? Are there individuals whose business it is to make them? Do they make any articles of metal; and if so, of what metals, and what is their mode of working them? How and by what means do they produce fire? Their modes of spinning, weaving, and dyeing, and the materials and implements used, are of great interest. What are their modes of trapping animals and taking fish; and how are their implements for these purposes constructed? Do they still retain the bow and arrow, or have they wholly or partially abandoned them for the use of firearms? The construction and mode of using all their implements should be described, and complete collections made of them. Their performances, too, in the way of what may be called the fine arts, merit attention; such as their drawings and paintings on smooth rocks or the barks of trees, or their vessels, their dwellings, etc.; and their carvings in wood and stone, as on pipe-bowls, paddles, bows, etc., etc. If native melodies should be discovered among them, they should by all means be noted down, together with the words sung with them.

Trade.—Do they carry on any traffic with each other, or with the whites? If so, of what articles does it consist, and how is it conducted? Have they any common standard of value which approaches the nature of money?

Religion.—What is the nature of their religious belief, as far as it

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can be ascertained? What are the objects of their worship? Have they any idea of a Creator of all things; and do they give any account of the creation? Do they worship the sun, fire, or the serpent? What becomes of men and animals after death? Are there any persons of the character of priests set apart for the performance of religious ceremonies? If so, how are they supported, and in what general estimation are they held? Have they a sacred fire, and is it kept perpetually burning?

Government.—Is the tribe commanded by the same chief or chiefs in peace and in war, or by different ones? What is the extent of a chief's authority; and how does he acquire it, by birth or by the choice of the people? What are the insignia of his office, and what his privileges? Who are entitled to speak in the councils of the tribe? What laws have they; for instance, what are the punishments for theft, for adultery, for murder; and by whom are punishments inflicted?

Social life.—Is slavery known among them? Is female chastity prized? What is the treatment of women by their husbands; of children by their parents? What is the division of labor between husband and wife? What festivals have they? enumerate them by their native names, and describe their import, and the manner in which they are celebrated. What ceremonies do they observe at births, marriages, and funerals? Are women obliged to live apart during their monthly terms, or after giving birth to a child? At what age do marriages take place, and what degrees of consanguinity are prohibited? May a man marry into the same band or tribe to which he belongs, or must he go to another for a wife? Do children belong to the tribe of the father or of the mother? Is polygamy practised? Do the several wives stand on a footing of equality, or is one superior to the rest; and if so, why? How is the body disposed of after death; and what articles, if any, are buried with it?

War.—Do the warriors array themselves in a peculiar attire and join in the war-dance before setting out? What are their weapons? What is their treatment of captives, especially if females? Do they practise scalping, and shave their own heads, all but the scalp-lock?

Medicine.—Are there any persons in the tribe whose profession it is to practise the cure of diseases, or is this a part of the business of the priest, or so-called "medicine-man?" What is their mode of treating the principal complaints? Do they practise blood-letting, tooth-pulling, or any other surgical operations? What plants do they use as remedies, and for what complaints is each one applied? It is

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hardly necessary to say that collections of such plants and their seeds should be made for cultivation and experiment at home.

Literature.—Have they any thing partaking of the nature of a literature among them; that is, have they any songs, tales, fables, and especially any historical legends? If they have, an endeavor should be made to record and preserve them; not so much for the information they may directly convey, as for the insight they must necessarily afford into the mental idiosyncrasy of the people. If there is any one capable of writing the language, it is much to be wished that these things should be set down in the original words, as well as an English translation.

If the Indians, like many tribes in the older States, use pictorial images for the purpose of recalling to memory the themes and general tenor of their songs, &c., specimens should be collected and delineated, and accompanied by copies of the documents they are intended to illustrate.

Calendar and Astronomy.—What divisions of time are in use among the Indians? How many days do they reckon to a month, and how many months to the year? What names are given to these days, and to the months; and what are the literal meanings of the names? Have they any length of the natural year? What names do they give to individual stars and constellations, particularly to those of the zodiac; and how do they account for eclipses? How do they ascertain and name the points of the compass? Have they any theory respecting the nature and motions of the stars, and respecting the causes of wind, rain, hail, snow, thunder, &c.?

History.—Have the tribe, as far as their knowledge extends, always lived on their present territory; if not, from what direction did they come, and to what other tribes do they state themselves to be related? What changes have been introduced among them by intercourse with the whites? With what tribes have they been, and are they now, at war? Give the name of their principal chief, and of any other eminent men among them, and of their predecessors, as far as they are remembered.

Antiquities.—Earthworks, of various forms and dimensions, and for various purposes, as for defence against enemies, for watch-towers, for funeral monuments, have been found in great numbers in the valley of the Mississippi and elsewhere; and an examination of their structure and contents has disclosed a variety of the most interesting facts respecting the races that erected them. If time and opportunity be afforded of properly examining one of them, it is highly desirable that

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it should be done. When a mound is opened, every particular respecting its position, size, form, and structure, should be noted down on the spot, the description being assisted by drawings of the ground-plan and elevation; and an accurate list should be taken of all the articles found in it. Such as are taken should be properly labelled, and kept by themselves, with the same care that is observed with respect to objects of natural history. When, however, the work cannot be thoroughly done, it is better to leave the mound unopened for a more favorable opportunity.

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PHILOLOGY.

In view of the importance of a uniform system in collecting words of the various Indian languages of North America, adapted to the use of officers of the government, travellers, and others, the following is recommended as a STANDARD VOCABULARY. It is mainly the one prepared by the late Hon. Albert Gallatin, with a few changes made by Mr. Hale, the Ethnologist of the United States Exploring Expedition, and is adopted as that upon which nearly all the collections hitherto made for the purpose of comparison have been based. For the purpose of ascertaining the more obvious relations between the various members of existing families, this number is deemed sufficient. The remote affinities must be sought in a wider research, demanding a degree of acquaintance with their languages beyond the reach of transient visitors.

The languages spoken within the limits of the United States, in which the greatest deficiencies exist, are those of the tribes comprised in the States of California and Texas, and the Territories of Utah, Nevada, and New Mexico, and to these attention is particularly directed. It is not intended, however, to confine the collection to the languages of the United States. Those of British and Russian America and of Mexico, particularly the western coast, fall within the purpose of this circular; and the alphabet may, in fact, with certain local adaptations, be used in any region.

Some of the words contained in it will of course be found inapplicable in particular sections of the country; as, for example, ice, salmon, and sturgeon among the southern tribes, buffalo among the coast tribes of the Pacific, and such should at once be omitted.

Where several languages are obtained by the same person in one district, the inquirer may substitute for these the names of familiar things, taking care that the same are carried through them all, and that they are those of native and not imported objects. Such words as coat, hat, etc., are of course useless for purposes of comparison, unless it is explained that they refer to the dress of deer-skin, the hat of basket-work used by the natives, and of their own primitive manufacture.

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As the languages of savage nations, being unwritten and without fixed standard, are subject to constant change, the number of dialects is everywhere considerable. The collector is therefore recommended to obtain vocabularies in each dialect; and for the greater certainty, to employ one of those already collected, on the correctness of which reliance can be placed, as the medium of obtaining others.

Whenever leisure and opportunity offer for the collection of larger vocabularies than that here given, it will of course be desirable to procure them; as also information concerning the grammatical structure of the language, such as the modes of forming the plurals in nouns and adjectives, their declension, the conjugation of verbs, the character and use of pronouns, the number and employment of adverbs, prepositions, &c. Grammars and dictionaries, never yet published, were made of many of the languages of Upper and Lower California and the Mexican States by the Spanish missionaries, and the Smithsonian Institution has been favored with the loan of several manuscripts which are in the course of publication. It is desired to procure others, or copies of them, whenever it is possible, from all parts of both the American continents, or of printed works on the same subject. The present form is issued for the use of travellers or merely transient residents among tribes where no such records are procurable.

In making collections, the utmost care is requisite to represent accurately the sounds of unfamiliar languages, particularly those which to us appear uncouth; and the inquirer should satisfy himself, by repetition of the words to other individuals, that he has correctly acquired their pronunciation. While the assistance of interpreters conversant with the language is desirable to insure a correct understanding, the words themselves should be taken down from the lips of an Indian of the tribe. A great difference indeed exists among Indians in the purity with which they speak their own language, chiefs and men of note and women of good standing, as a general thing, speaking more correctly than common persons. Great patience is necessary to secure accuracy, as their attention soon becomes fatigued by being kept on the stretch. Whenever this is observed to be the case, it is best to postpone the subject for a time, if possible.

The character of the Indian mind is so essentially different from that of the white man, they think in so different a manner, that many precautions are necessary to avoid giving them wrong impressions of our meaning, and of course obtaining incorrect replies.

Indians not only distinguish by different names the degrees and

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modifications of relationship, such as the elder from the younger brother and sister, but women use different words from men in addressing their relations; as, for instance, a man employs one word in saying "my father," and a woman another. Again, different words are, at least in some languages, used in speaking *of* one's parents from those used in speaking *to* them. It is, therefore, necessary either to give each form, or to specify by what sex and in what sense the words are used. Further to prevent uncertainty, it is preferable to employ the possessive pronoun in connection with the word, as given in the vocabulary, *e. g.*, "my father," &c.; and this is, in fact, in consonance with Indian practice.

Their languages are deficient in *generic* terms, or those representing classes of objects. Thus very few possess words equivalent to "tree," "bird," "fish," &c., though names will be found for every particular species, as each kind of oak and pine, of duck or salmon; and of certain animals, such as deer, there will be found, besides the specific name, black or white-tailed deer, as the case may be, separate words signifying buck, doe, and fawn, as with us. It is, therefore, essential in obtaining such names, to ascertain definitively the object intended, and to note this in the vocabulary.

This tendency to particularize extends to almost every class of objects. In regard to parts of the body, it has been found that in many languages there is no one word for arm or leg, but separate ones for the upper arm, and that below the elbow; for the thigh, and that part below the knee. Even of the hands and feet there are often no names embracing the whole. So, too, the words "leaf," "bark," are represented by distinct names, according to their character, as broad and needle-shaped leaves, the woody and fibrous barks. Sheath and pocket knives and the various forms of canoes have in like manner each their specific names.

In respect to particular words, the following points may be noted:

Man. This must be carefully distinguished from the word "person," the collective of which is "people," *i. e.*, Indians.

Boy, Girl, Infant. The answer often given for these is simply "little man," "little woman," "little one."

Husband and *wife.* Distinct words exist in most languages for these relationships; in others, it would seem as if there was only "my man," "my woman."

Indians, people. Care must be taken that the name of the tribe is not given unless really so designated.

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Head. A very common mistake to be guarded against is the substitution of hair or scalp.

Face. The name for the forehead or eyes is, in some cases, employed for the whole face.

Neck. Throat is apt to be given instead of neck.

In naming parts of the body, as well as relationship, it will be found a very common practice with Indians to prefix the pronoun "my" to each one, as "my head," &c. The recurrence of the same syllable at the beginning of each word will indicate this.

Town, village. Generally speaking, the same word is given as for house, or it is rendered "many houses." In New Mexico, *pueblo* would have a different meaning from the habitations of the wild tribes.

Warrior. Among the tribes of the Pacific coast, where there is no distinctive class of warriors, this is frequently rendered "strong man," "quarrelsome," &c.

Friend is a word of very indefinite meaning. Instead of it, "cousin," or "one liked," will often be given.

Sun and *moon.* Curiously enough, these, among several tribes, bear the same name and are actually supposed to be the same. Others use for moon "night sun."

The Seasons. These words have been retained, though it is questionable if they have a very definite signification with Indians. The names of particular months, or "moons," warm or cold weather, or the periods in which particular occupations are followed probably, in most cases, replace them.

River, lake. For these simply the word "water" will often be given, as, among tribes of limited range, their own river or lake is "the water" which they best know.

Mountain. "Rock" is frequently the translation. Some tribes, again, apply a special name to snow peaks.

The colors. The idea of color seems to be indistinct, dark blue and dark green having, in many languages, the same name as black, and yellow the same as light green.

Old and *young.* Care should be taken that the words for "old man," "young man," are not supplied; or, on the other hand, "worn out," and "new," as is often the case.

Alive is frequently rendered "not dead."

Cold, warm. Here, again, caution is requisite, as cold or warm *weather* may be given instead.

Yesterday and *to-morrow.* In some languages, a single word is used for both, the distinction being made only by the connection.

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Numerals. Many tribes go no farther in counting than ten, and among those of California, it is said, some have no names for numbers beyond five. Others, on the contrary, have different sets of numerals, or rather their numerals have different terminations, one class being used in ordinary counting, the other applying to men, money, &c.

Pronouns. The personal pronouns are of two classes, one simple or absolute, the other variously called fragmentary and copulative. These last are used only in composition, as in the form of prefixes and suffixes to the verbs.

Verbs. It is a matter of dispute whether the Indian verb has any true infinitive mood, as "to go," "to eat," &c., and its simplest form appears to be, in all cases, the third person singular present, "he goes," "he eats." It will be better, therefore, to obtain either this form or that of the first person, "I go," &c. The last will be found often to be combined with the copulative pronoun.

ORTHOGRAPHY.

It is, of course, essential to the proper understanding by others of the words collected, especially in view of general comparisons, that a precise and fixed system of spelling should be used, and this is more so where the usual language of the collector is English than where French or Spanish, as there is far less certainty in the pronunciation of the first than of these last. In English, for instance, four different sounds are given as belonging to the letter *a*, viz.: those in *far*, *fall*, *fat*, *fate*. As regards the simple vowels, the difficulty can be partly remedied by employing the Spanish or Italian sounds, as given below, and a further advantage will be found in separating the words into syllables and marking the principal one with an accent, thus. Da-ko′-ta. There are, however, in every language, sounds peculiar to itself, and the different Indian tongues abound in them, many being almost beyond our capacity to imitate and certainly to write, without some addition to the ordinary alphabet. Various systems, contemplating a universal alphabet, or one applicable to all languages, have been devised, each having its peculiar merits; but the great difficulty, never fully overcome, has been to represent intelligibly such unfamiliar sounds without confusing the inquirer with new characters or numerous marks, or, again, by employing several letters to represent a single sound. The alphabet here recommended for adoption, without pretending to remedy these defects, will at least prove an assistance to the collector in the field. Should it be necessary to repre-

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sent other sounds, not included below, it will be better for him to adopt some arbitrary mark of his own, describing fully its value or meaning.

VOWELS.

A as long in *father*, and short in German *hat* (nearly as in English *what*).

E as long in *they* ("long *a*" in *face*), short in *met*.

I " " " *marine*, short in *pin*.

O " " " *go*, short in *home*, *whole* (as generally pronounced in the northern States).

U as long in *rule* (*oo* in *fool*), short in *full* (*oo* in *good*). *U* as in *union*, *pure*, &c.; to be written *yu*.

Â as in *all* (*aw*, *au* in *bawl*, *taught*).

A̲ " " *fat*.

U̲ " " *but* (*o* in *love*, *oo* in *blood*).

AI " " *aisle* ("long *i*" in *pine*).

AU as *ow* in *now*, *ou* in *loud*.

The distinction of long and short vowels to be noted, as far as possible, by the division into syllables, joining a following consonant to a short vowel, and leaving the vowel open if long. Where this is insufficient, or where greater distinctness is desirable, a horizontal mark above, to indicate a long vowel, a curved mark a short one, thus: *ā*, *ă*, *ē*, *ĕ*, &c. A nasal syllable, like those found so commonly in French, to be marked by an index, *n*, at the upper right-hand corner of the vowel; thus o^n, $â^n$, a^n, u^n, will represent the sounds of the French *on*, *an* or *en*, *in*, and *un*, respectively.

CONSONANTS.

B as in English *blab*.

C not to be used excepting in the compound *ch*; write *k* for the hard sound, *s* for the soft.

D as in English *did*.

F " " " *fife*.

G " " " *gig*, never for the soft sound, as in *ginger*; for this use always *j*.

H as in English *how*, *hoe*, *handle*.

J " " " *judge*.

K " " " *kick*.

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L as in English *lull.*
M " " " *mimic.*
N " " " *noon.*
P " " " *pipe.*
Q not to be used: for *qu* write *kw.*
R as in English *rear.*
S " " " *sauce.*
T " " " *tight.*
V " " " *vow.*
W " " " *wayward.*
X not to be used: write *ks* or *gz*, according to the sound, in *wax*, *example.*
Y as in English *you*, *year.*
Z " " " *zeal*, *buzz.*
Ñ as *ng* in English, *singing.*
SH as in English *shall*, *shoe.*
ZH as *z* in *azure*, *s* in *fusion.*
CH as in English *church.*
TH " " " *thin*, *truth.*
DH as *th* in *the*, *with.*
KH a surd guttural aspirate, the German *ch* in *ach*, *loch*, *buch*, and sometimes approaching that in *ich*, *recht*, *bücher.*
GH a sonant guttural aspirate (Arabic *ghain*); other compounds, like the clucks occurring in Chinook, &c., to be represented by *kl*, *tkl*, *tlk*, &c., according to their analysis.

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COMPARATIVE VOCABULARY.

	ENGLISH. *Name of tribe.*		SPANISH. *Nombre de la tribu.*
1	man	1	hombre
2	woman	2	mujer
3	boy	3	muchacho
4	girl	4	muchacha
5	infant	5	niño ó niña.
6	my father (said by son)	6	mi padre (dice el hijo)
7	my father (said by daughter)	7	mi padre (dice la hija)
8	my mother (said by son)	8	mi madre (dice el hijo)
9	my mother (said by daughter)	9	mi madre (dice la hija)
10	my husband	10	mi marido
11	my wife	11	mi esposa
12	my son (said by father)	12	mi hijo (dice el padre)
13	my son (said by mother)	13	mi hijo (dice la madre)
14	my daughter (said by father)	14	mi hija (dice el padre)
15	my daughter (said by mother)	15	mi hija (dice la madre)
16	my elder brother	16	mi hermano mayor
17	my younger brother	17	mi hermano menor
18	my elder sister	18	mi hermana mayor
19	my younger sister	19	mi hermana menor
20	an Indian	20	Indio
21	people	21	gente
22	head	22	cabeza
23	hair	23	pelo
24	face	24	cara
25	forehead	25	frente
26	ear	26	oreja
27	eye	27	ojo
28	nose	28	nariz
29	mouth	29	boca

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COMPARATIVE VOCABULARY.

	FRENCH. *Nom de la tribu.*		LATIN. *Nomen nationis.*
1	homme	1	vir, homo
2	femme	2	mulier
3	garçon	3	puer
4	fille	4	puella
5	enfant	5	infans
6	mon père (dit le fils)	6	pater meus (dicit filius)
7	mon père (dit la fille)	7	pater meus (dicit filia)
8	ma mère (dit le fils)	8	mater mea (dicit filius)
9	ma mère (dit la fille)	9	mater mea (dicit filia)
10	mon mari	10	sponsus meus
11	mon épouse	11	uxor mea
12	mon fils (dit le père)	12	filius meus (dicit pater)
13	mon fils (dit la mère)	13	filius meus (dicit mater)
14	ma fille (dit le père)	14	filia mea (dicit pater)
15	ma fille (dit la mère)	15	filia mea (dicit mater)
16	mon frère ainé	16	frater meus natu major
17	mon frère cadet	17	frater meus natu minor
18	ma sœur ainée	18	soror mea natu major
19	ma sœur cadette	19	soror mea natu minor
20	sauvage	20	Indus
21	peuple	21	populus
22	tête	22	caput
23	cheveux	23	crinis
24	figure	24	facies
25	front	25	frons
26	oreille	26	auris
27	œil	27	oculus
28	nez	28	nasus
29	bouche	29	os

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	ENGLISH.		SPANISH.
	Name of tribe.		*Nombre de la tribu.*
30	tongue	30	lengua
31	teeth	31	dientes
32	beard	32	barba
33	neck	33	cuello
34	arm	34	brazo
35	hand	35	mano
36	fingers	36	dedos
37	thumb	37	dedo pulgar
38	nails	38	uñas
39	body	39	cuerpo
40	chest	40	pecho
41	belly	41	barriga
42	female breasts	42	pechos de mujer
43	leg	43	pierna
44	foot	44	pié
45	toes	45	dedos del pié
46	bone	46	hueso
47	heart	47	corazon
48	blood	48	sangre
49	town, village	49	pueblo, villa, aldea
50	chief	50	jefe
51	warrior	51	guerrero
52	friend	52	amigo
53	house	53	casa
54	skin lodge	54	casa de cueros
55	kettle	55	caldera
56	bow	56	arco
57	arrow	57	flecha
58	axe, hatchet	58	hacha
59	knife	59	cuchillo
60	canoe	60	canoa
61	moccasins	61	zapatos Indios
62	pipe	62	pipa

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	FRENCH. *Nom de la tribu.*		LATIN. *Nomen nationis.*
30	langue	30	lingua
31	dents	31	dentes
32	barbe	32	barba
33	cou	33	collis
34	bras	34	brachium
35	main	35	manus
36	doigts	36	digiti
37	pouce	37	digitus pollex
38	ongles	38	ungues
39	corps	39	corpus
40	poitrine	40	sternum
41	ventre	41	venter
42	mamelles	42	ubera
43	jambe	43	crus
44	pied	44	pes
45	doigts du pied	45	digiti pedis
46	os	46	os
47	cœur	47	cor
48	sang	48	sanguis
49	bourg, village	49	oppidum, pagus
50	capitaine	50	dux
51	guerrier	51	miles
52	ami	52	amicus
53	maison	53	domus
54	loge de peaux	54	tentorium e pellibus
55	chaudière	55	lebes
56	arc	56	arcus
57	flèche	57	sagitta
58	hache	58	ascia
59	couteau	59	culter
60	canot	60	scapha Indica
61	souliers de sauvage	61	calceamenta Indica
62	pipe	62	tubus nicotianus

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	ENGLISH. *Name of tribe.*		SPANISH. *Nombre de la tribu.*
63	tobacco	63	tabaco
64	sky	64	cielo
65	sun	65	sol
66	moon	66	luna
67	star	67	estrella
68	day	68	dia
69	night	69	noche
70	morning	70	mañana
71	evening	71	tarde
72	spring	72	primavera
73	summer	73	verano
74	autumn	74	otoño
75	winter	75	invierno
76	wind	76	viento
77	thunder	77	trueno
78	lightning	78	relámpago
79	rain	79	lluvia
80	snow	80	nieve
81	fire	81	fuego
82	water	82	agua
83	ice	83	hielo
84	earth, land	84	tierra
85	sea	85	mar
86	river	86	rio
87	lake	87	lago
88	valley	88	valle
89	prairie	89	llano
90	hill, mountain	90	cerro, montaña
91	island	91	isla
92	stone, rock	92	piedra, roca
93	salt	93	sal
94	iron	94	hierro
95	forest	95	bosque, selva

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	FRENCH.		LATIN.
	Nom de la tribu.		*Nomen nationis.*
63	tabac	63	nicotianum
64	ciel	64	cœlum
65	sol	65	sol
66	lune	66	luna
67	étoile	67	stella
68	jour	68	dies
69	nuit	69	nox
70	matin	70	tempus matutinum
71	soir	71	vesper
72	printemps	72	ver
73	été	73	æstas
74	automne	74	autumnus
75	hiver	75	hibernus
76	vent	76	ventus
77	tonnerre	77	tonitru
78	éclair	78	fulgur
79	pluie	79	pluvium
80	neige	80	nix
81	feu	81	ignis
82	eau	82	aqua
83	glace	83	glacies
84	terre	84	terra
85	mer	85	mar
86	fleuve, rivière	86	flumen
87	lac	87	lacus
88	vallée	88	vallis
89	prairie	89	pratum
90	côte, montagne	90	collis, mons
91	île	91	insula
92	pierre, roche	92	petra, saxum
93	sel	93	sal
94	fer	94	ferrum
95	forêt	95	sylva

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	ENGLISH. *Name of tribe.*		SPANISH. *Nombre de la tribu.*
96	tree	96	árbol
97	wood	97	madera
98	leaf	98	hoja.
99	bark	99	corteza
100	grass	100	zacate
101	pine	101	pino
102	maize	102	mais
103	squash	103	calabaza
104	flesh, meat	104	carne
105	dog	105	perro
106	buffalo	106	bisonte, búfalo
107	bear	107	oso
108	wolf	108	lobo
109	fox	109	zorra
110	deer	110	ciervo
111	elk	111	
112	beaver	112	castor
113	rabbit, hare	113	conejo
114	tortoise	114	tortuga
115	horse	115	caballo
116	fly	116	mosca
117	mosquito	117	mosquito
118	snake	118	culebra, serpiente
119	rattlesnake	119	culebra de cascabel
120	bird	120	ave
121	egg	121	huevo
122	feathers	122	plumas
123	wings	123	alas
124	goose	124	ganso
125	duck (mallard)	125	pato
126	turkey	126	pavo, guanajo
127	pigeon	127	pichon
128	fish	128	pez

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	FRENCH.	LATIN.
	Nom de la tribu.	*Nomen nationis.*
96	arbre	arbor
97	bois	lignum
98	feuille	folium
99	écorce	cortex
100	herbe	herba
101	pin	pinus
102	maïs	zea maiz
103	citrouille	cucurbitus
104	chair	caro
105	chien	canis
106	buffle	bison, bos americanus
107	ours	ursus
108	loup	lupus
109	renard	vulpes
110	cerf	cervus
111	élan	cervus canadensis
112	castor	castor
113	lapin, lièvre	lepus
114	tortue	testudo
115	cheval	equus
116	mouche	musca
117	maringouin	culex
118	serpent	serpens
119	serpent à sonnettes	crotalus
120	oiseau	avis
121	œuf	ovum
122	plumes	plumæ
123	ailes	alæ
124	oie	anser
125	canard	anas boschas
126	dindon	pavo
127	tourte	columba
128	poisson	piscis

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	ENGLISH.		SPANISH.
	Name of tribe.		*Nombre de la tribu.*
129	salmon	129	salmon
130	sturgeon	130	esturion
131	name	131	nombre
132	white	132	blanco
133	black	133	negro
134	red	134	colorado
135	light blue	135	azul celeste
136	yellow	136	amarillo
137	light green	137	verde
138	great, large	138	grande
139	small, little	139	pequeño
140	strong	140	fuerte
141	old	141	viejo
142	young	142	jóven
143	good	143	bueno
144	bad	144	malo
145	dead	145	muerto
146	alive	146	vivo
147	cold	147	frio
148	warm, hot	148	caliente
149	I	149	yo
150	thou	150	tú
151	he	151	él
152	we	152	nosotros
153	ye	153	vosotros
154	they	154	ellos
155	this	155	este
156	that	156	aquel
157	all	157	todo, todos
158	many, much	158	mucho, muchos
159	who	159	quien
160	far	160	lejos
161	near	161	cerca de

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	FRENCH. *Nom de la tribu.*		LATIN. *Nomen nationis.*
129	saumon	129	salmo
130	esturgeon	130	sturio
131	nom	131	nomen
132	blanc	132	albus
133	noir	133	niger
134	rouge	134	rubrum
135	bleu	135	cœruleum
136	jaune	136	amarillis
137	vert	137	viridis
138	grand	138	magnus
139	petit	139	parvus
140	fort	140	fortis
141	vieux	141	vetus
142	jeune	142	juvenis
143	bon	143	bonus
144	mauvais	144	malus
145	mort	145	mortuus
146	vivant	146	vivus
147	froid	147	frigidus
148	chaud	148	calidus
149	je	149	ego
150	tu	150	tu
151	il	151	ille
152	nous	152	nos
153	vous	153	vos
154	ils	154	illi
155	ceci	155	iste
156	cela	156	ille
157	tout, tous	157	omnis, totus
158	beaucoup	158	multus
159	qui	159	qui
160	loin	160	longe
161	près	161	prope

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	ENGLISH. *Name of tribe.*		SPANISH. *Nombre de la tribu.*
162	here	162	aquí
163	there	163	allá
164	to-day	164	hoy
165	yesterday	165	ayer
166	to-morrow	166	mañana (el dia de)
167	yes	167	sí
168	no	168	no
169	one	169	uno
170	two	170	dos
171	three	171	tres
172	four	172	cuatro
173	five	173	cinco
174	six	174	seis
175	seven	175	siete
176	eight	176	ocho
177	nine	177	nueve
178	ten	178	diez
179	eleven	179	once
180	twelve	180	doce
181	twenty	181	veinte
182	thirty	182	treinta
183	forty	183	cuarenta
184	fifty	184	cincuenta
185	sixty	185	sesenta
186	seventy	186	setenta
187	eighty	187	ochenta
188	ninety	188	noventa
189	one hundred	189	ciento
190	one thousand	190	mil
191	to eat	191	comer
192	to drink	192	beber
193	to run	193	correr
194	to dance	194	bailar

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	FRENCH. *Nom de la tribu.*		LATIN. *Nomen nationis.*
162	ici	162	hic
163	là	163	illuc
164	aujourd'hui	164	hodie
165	hier	165	heri
166	demain	166	cras
167	oui	167	ita
168	non	168	minime
169	un	169	unus
170	deux	170	duo
171	trois	171	tres
172	quatre	172	quatuor
173	cinq	173	quinque
174	six	174	sex
175	sept	175	septem
176	huit	176	octo
177	neuf	177	novem
178	dix	178	decem
179	onze	179	undecim
180	douze	180	duodecim
181	vingt	181	viginti
182	trente	182	triginta
183	quarante	183	quadraginta
184	cinquante	184	quinquaginta
185	soixante	185	sexaginta
186	soixante-dix	186	septuaginta
187	quatre-vingts	187	octoginta
188	quatre-vingt-dix	188	nonaginta
189	cent	189	centum
190	mille	190	mille
191	manger	191	edere
192	boire	192	bibere
193	courir	193	currere
194	danser	194	saltare

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	ENGLISH.		SPANISH.
	Name of tribe.		*Nombre de la tribu.*
195	to sing	195	cantar
196	to sleep	196	dormir
197	to speak	197	hablar
198	to see	198	ver
199	to love	199	amar
200	to kill	200	matar
201	to sit	201	sentarse
202	to stand	202	estar en pié
203	to go	203	ir
204	to come	204	venir
205	to walk	205	andar
206	to work	206	trabajar
207	to steal	207	robar
208	to lie	208	mentir
209	to give	209	dar
210	to laugh	210	reir
211	to cry	211	gritar

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	FRENCH. *Nom de la tribu.*		LATIN. *Nomen nationis.*
195	chanter	195	cantare
196	dormir	196	dormire
197	parler	197	loqui
198	voir	198	videre
199	aimer	199	amare
200	tuer	200	cædere
201	s'asseoir	201	sedere
202	se tenir debout	202	stare
203	aller	203	ire
204	venir	204	venire
205	marcher	205	ambulare
206	travailler	206	operari
207	voler	207	furare
208	mentir	208	mentiri
209	donner	209	dare
210	rirè	210	ridere
211	crier	211	clamare

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INSTRUCTIONS

RELATIVE TO THE

ETHNOLOGY AND PHILOLOGY OF AMERICA.

APPENDIX A.

PHYSICAL CHARACTER OF THE INDIAN RACES.

INVESTIGATIONS are now being made into the physical character of the soldiers composing the armies of the United States, embracing a large number of measurements of different parts of the body, designed to ascertain the effect of climate, locality, and mode of life upon men, the average size and proportions of troops of the United States as compared with those of foreign countries, and those of the different States as compared with each other.

In connection with this inquiry it is deemed a matter of interest to extend the examination to the Indian tribes of America, and to ascertain the proportions of the aboriginal races as compared with those of European descent, and also the effects of different food, climate, and mode of life upon the various tribes of the former.

The measurements selected for this purpose are, for various reasons, limited to a smaller number than in the case of the army, and with the exception of that of weight, which as being variable is of the least consequence, are such as can be taken with a tape-measure. They should be made with great care in feet, inches, and tenths of an inch.

Persons familiar with the Indians are aware that a great difference exists in the complexion, not merely of individuals, but of tribes. In some cases that peculiar reddish tinge of the skin which has given to the race the name of "Red" or "Copper-colored Men" is predominant and marked; in others a light brown is the more common; again, a yellowish or somewhat orange hue exhibits itself; and, finally, some approach nearly to black. Among the lighter colored the red often shows in the

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cheek. Nor are these diversities due altogether to climate or exposure. There seem to be well authenticated instances in which food also influences complexion. Thus it is said that among the Chepewyan tribes of British America, the Cariboo or Reindeer eaters are much darker than the cognate tribes who live on fish, and this, too, although they inhabit a far northern latitude. The texture of the skin is a noticeable feature. That of the younger Indians, where it can be perceived through the dirt, is usually exceedingly soft and delicate, but becomes wrinkled with middle age. An important difference in the color of the hair also occasionally shows itself. For instance, the Indians of the Nooksahk tribe, in the neighborhood of Mount Baker, Washington Territory, have often light-brown and even flaxen hair in youth, which, however, grows dark with age, and yet their blood is unmixed. When neglected and exposed to the sun the hair becomes of a rusty hue, and like that of whites loses its gloss. Among some of the Pueblo tribes of New Mexico albinos are not uncommon. Hazel eyes are frequent among the Indians of the lower Klamath.

Particular information should be given as to their food, whether consisting of game, fish, maize, roots, &c., and even as to the kinds of either, whether of buffalo, elk, deer, or cariboo, of salmon or other varieties of river fish, or of the various animal productions of the sea, such as the whale, walrus, seals, &c., as among the Esquimaux and some of the Northwest Coast Indians.

Their mode of life will, of course, influence the development of the form. Among the tribes who live almost altogether on horseback, or in canoes, we may expect to see the legs comparatively small, while in the latter the arms will be proportionately large. Among the mountain tribes, on the other hand, the legs will be more muscular and the chest expanded. As a general rule their limbs are rounded, and the separate muscles are not developed as in the white and black races. As to this, observations are requested.

The age of Indians it is very difficult, in most cases impossible, to ascertain, as they keep no record even in memory. An estimate founded on careful observation will, however, afford a reasonable approximation. Sometimes a reference to a known event as having occurred when they were of the size of some young boy will afford a guide. As the men usually marry young,

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the age of their families furnishes often another. A great age, notwithstanding apparent decrepitude, is very rarely attained, especially by the male sex.

In the case of mixed breeds it is by all means desirable to ascertain and state whether either one or both parents were themselves mixed, and, if so, to what degree. Any observations on the comparative physical development, health, and length of life among the mixed breeds will be very gladly received.

Where the inquiry is made by medical men, other points will naturally suggest themselves. Among them, it will be well to ascertain the number of regular pulsations and respirations per minute.

It is hardly necessary to add that these measurements should be confined to adult males. Observations on boys who have not attained their growth would have no value.

PARTICULARS OF INQUIRY.

In order to avoid the necessity of transcribing the questions, references may be made to the numbers and letters. Separate tables in quarto have been prepared, and will be furnished on application to the Smithsonian Institution.

1. Name of Indian.
2. Name of tribe.
3. If of mixed blood, in what proportion?
4. Country occupied by tribe.
5. Mode of subsistence, whether by hunting, fishing, &c. Habits, whether used to riding, foot, or canoe travel.
6. Articles of usual food.
7. Age (by estimation) between 20 and 30, 30 and 40, &c.
8. State of general health.
9. Weight in lbs. and half lbs.
10. General complexion, whether reddish, brown, yellowish, or black.

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11. Hair, color of.

12. Eyes, color of.
    - *a.* Whether oblique or not.
    - *b.* Distance between outer angles over root of nose.

13. Teeth.
    - *a.* How many are lost?
    - *b.* Are they much ground down by hard food?
    - *c.* Do the opposing incisor teeth of the two jaws rest on each other, do they overlap?

14. Entire height without shoes.

15. Head.
    - *a.* Largest circumference around.
    - *b.* Distance between orifices of ears over top of head.
    - *c.* Distance from root of nose over top of the head to base of skull.

16. Arm.
    - *a.* Length outside from point of shoulder cap to tip of middle finger.
    - *b.* Length from same to point of elbow when bent.
    - *c.* Length from point of elbow to lower end of ulna.
    - *d.* Length from lower end of ulna to tip of middle finger.
    - *e* Largest girth of arm.
    - *f.* Largest girth of forearm.
    - *g.* Largest girth of hand.

17. Distance from upper centre of breast bone to end of middle finger, arm extended.

18. Breadth of shoulders behind.

19. Girth of neck.

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20. Girth of chest around nipples.
    - *a.* With full inspiration.
    - *b.* After expiration.
21. Girth of waist.
22. Girth around hips on level with the head of the thigh bones.
23. Leg.
    - *a.* Height from ground to top of hip-bone, outside.
    - *b.* Height to knee-joint outside.
    - *c.* Height to crotch inside.
    - *d.* Largest girth of thigh.
    - *e.* Largest girth of leg.
24. Foot.
    - *a.* Length from tip of great toe to extremity of heel.
    - *b.* Girth of instep.
    - *c.* Girth around heel and instep.

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INSTRUCTIONS

RELATIVE TO THE

ETHNOLOGY AND PHILOLOGY OF AMERICA.

APPENDIX B.

NUMERAL SYSTEMS.

In the original circular of "Instructions" allusion was made to the fact that some of the Indian tribes use different sets of numerals, or rather modifications of the numerals, as applied to different objects. This fact, in connection with the various serial systems upon which their enumeration is based, presents a subject worthy of particular inquiry, the more especially as the same singularity exists among other distant and distinct barbarous nations.

Mr. Gallatin in his "Notes on the Semi-Civilized Nations of Mexico," &c., published in the Transactions of the American Ethnological Society (vol. ii. p. 54, et seq.), says: "Another peculiarity of the Mexican and Maya, and of which traces may be seen in other languages of the same group, is the alteration which the numerals undergo according to the nature of the object to be counted. The distinctions are not always easy to be understood; and the objects of the same class, that is to say in counting which the same altered numeral is used, are apparently of the same incongruous nature. Those stated by Father Alonzo de Molina for the Mexican language, are as follows:—

1	ce, cem	6	chica-ce
2	ome	7	chic-ome
3	yey	8	chic-uey
4	naui	9	chicu-naui
5	macuilli	10	mat-lactli

20 cem-poualli"

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I have excerpted only the first ten numerals and the word for twenty from Mr. Gallatin's Table *A*. He proceeds:—

"The numerals as laid down in Table *A*. are used in counting animated beings, mantas, mats, paper, tortillas, ropes, skins, canoes, cycles, knives, and candles; but in counting several of these, the word *pilli* and sometimes *quimilli*, is substituted for *poualli* (20).

"The syllable *tetl* is added to the numerals, and these lose their last syllable (*matlactetl* for *matlacti*, *cem-poualtetl* for *cem-poualli*) when counting fowls, eggs, cocoa, jars, frijoles, fruits, roots, rolls, or round things.

"The word *pantli* is added to the numeral when speaking of ridges made by the plough, of walls, files of men, and of other things arranged in length.

"*Tlementli* is added to the numeral when speaking of speeches, dishes, bags, shields, or when a thing is doubled above another, or when speaking of things differing one from the other."

No reference to such a system is to be found in the Grammatical sketch of the HEVE, translated by Mr. Buckingham Smith (No. III of Shea's Linguistics); in the Nevome Grammar (ibid. No. V), the mutsun of Father Arroyo (ib. No. IV), or Father Sitjars vocabulary of the San Antonio (ib. No. VII), the only extended works at present accessible on the languages of Sonora and California, but it is very possible that it may exist there and have escaped notice.

In Father Pandosy's Grammar of the Yakama, a Sahaptin language of Washington Territory (Shea's Linguistics, No. V), the numerals are not specially referred to; but in the accompanying dictionary *metat* is given for three, *metao*, three persons; *pinept* for four, *pinapo* four persons; *parat* five, *par-nao*, five persons, and other numerals are given in duplicate or triplicate without explanation.

Father Mengarini, in his Grammar of the Selish, or Flathead of the Rocky Mountains (Shea, No. II.), says of the cardinal numbers, "they are duplex, one set relating to things, the other to persons, thus:—"

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	Relating to things.	*Relating to persons.*
1	nko	schnaksi
2	esèl	chesèl
3	chèlès	ch'chèlès
4	mús	ch'músmas
5	zil	ch'zilzil
6	tàckan	ch'tackan
7	sispel	ch'sispel
8	hèhènem	ch'hèhènem
9	ganút	ch'ganut
10	open	ch'open

Similar changes exist in other dialects of the Selish, of which the following from the Nisqually will serve as an instance:—

	Applied to men.	*Applied to money.*
1	dut-cho	che-élts
2	sale	sla-élts
3	klekhw	kle-hwélts
4	bōs	bōs-élts
5	tsa-lats	tslat-sélts
6	dze-lá-chi	dzlatch-élts
7	tsōks	tsok-sélts
8	t'ká-chi	t'ka-chi-élts
9	hwul	hwul-élts
10	pa-duts	pa-dats-élts
20	sa-lá-chi	

Zeisberger in his "Grammar of the Language of the Lenni-Lenape, or Delaware Indians" (Trans. Am. Phil. Soc., N. S., vol. iii), gives the list of numerals, without stating its application, as follows:—

1	ngutti	6	guttasch
2	nischa	7	nischasch
3	nacha	8	chasch
4	nawo	9	peschkouk
5	palenach	10	tellen

And then adds the following, used in respect to inanimate objects, as towns, rivers, houses, &c.

Mawat, ngutti, one, only one, and in the plural, *nischenol*, two, *nachenol*, three, &c., concerning which he observes, "When men, animals, or other things are spoken of, which among the

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Indians are considered as belonging to the animated class of beings, they say: *mauchsa, mayauchsu*, one person, or a person, or living being. It is truly incorrect to say *ngutti lenno*, a man. And in the plural, *nischowak lennowak*, two men, &c.

All and *ak*, the terminations of these last in the plural, are respectively applied, the former to inanimate, the latter to animate objects. But as exceptions, it is stated that among nouns, trees and the larger plants are considered animate, while fishes take the inanimate termination. It is thus evident that a similar idea has governed the form of the numeral adjective in the Delaware and the Mexican.

Other examples among the North American languages might be cited, but the above are sufficient to indicate the object of inquiry. The system appears, however, not to have been universal, as, according to Dr. Wilson, there is no distinction of numerals in the Seneca or other Iroquois languages.

Singularly enough, the same idea prevails in the numerals of other and far distant races, of which a few specimens may be useful.

The Hon. John Pickering, in "Memoirs of the American Academy," N. S., vol. ii, gives an account of the language and inhabitants of Tobi, or Lord North's Island, in the Indian Archipelago, derived from an American seaman, Horace Holden, who spent two years upon it. This island is situated about lat. 3° 2′ north and lon. 131° 4′ east, and is of very small extent and sparsely inhabited. The different forms of the digits are thus given in the accompanying vocabulary:—

	General cardinals.	*For cocoanuts.*	*For fish.*
1	yat	su	simŭl
2	guh-lu	guó	gwimŭl
3	ya	sarú	srimŭl
4	van	vao	vamŭl
5	ni	limó	nimŭl
6	wŏr	waru	wawrimŭl
7	vish	vishu	vishi-emŭl
8	wawr	tiu (?)	wawrimul
9	tiú	(wanting)	tuimul
10	se *or* sek	sek	sek

He adds, however, that in counting out fish, they proceed by pairs or couples, as, two, four, six, &c.

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In counting *fish hooks*, they use still a different set of numerals, which were not recollected. It would appear further that stones, birds, and days were counted by the same numerals as cocoanuts, and men and women by those employed to enumerate fish.

Mr. Hale, in the "Ethnography, &c., of the U. S. Exploring Expedition," copies Holden's vocabulary, which is also appended to a narrative of his captivity, published at Boston.

Dr. L. H. Gulick, in his notes on the Grammar of the Ponape dialect (12mo. Honolulu, 1858, pp. 39), states that "the enumeration of all objects is alike as far as *nine*, after which there is a singular variety." The difference is in—

"I. The mode of counting all animated objects, and all kinds of sticks and timbers, and everything that to a native is connected in idea with separate sticks, as trees, canoes, &c.

"II. The enumeration of yams, taro, and a few of the most costly articles.

"III. The numbering of cocoanuts, bread-fruits, eggs, shells, stones, &c., in fact, probably, of all common, least valued objects, not included under the first head."

Examples are given, not necessary to repeat here, as also of peculiarities in the numerative particles.

The Island of Ponape, Panopa, or, as written by Mr. Hale, Bonabe, is one of the central islands of Micronesia. That gentleman gives also a vocabulary of the language of Taputeoua, in the Kingsmill group, one of the most eastern, and separated from Tobi by 2600 miles. Speaking of the numerals, he says that the natives furnished the expedition with several sets or classes, which he conjectured were used in counting objects of different kinds, though he had no means of obtaining from them any explanation. There were five of them in all, and all given in the digits, or from one to ten.—Eth. of Ex. Exp. p. 440.

Leaving Micronesia for Polynesia, Mr. Hale states that some of the terms for the higher numbers are only used in counting particular articles. For *four*, the Hawaiians, for instance, have two terms, *ha* and *tauna*. For forty, they have *tanahá*, *iato*, and *ta'au*. The first of these, *tanahá*, is the general term; *iato* is used in counting pieces of *tapa* (native cloth), and *ta'au* in counting fish. (Ib. p. 250.)

It is remarkable that thus, in Tobi and Taputeoua, the distinction should extend to all the digits; and in Ponape, which

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is between the two, and Hawaii, distant 3500 miles, it should be confined to the higher numbers.

The last example here presented is from Bowen's Yoruba Dictionary, in the 10th vol. Smithsonian Contributions. In this, an African Language, traces of the same system also appear. Thus in ordinary counting the first vowel is short, while among what the author terms "cardinals of price," up to forty, the vowel is long; thus *okay*, one, *edzì*, two; *ōkay*, *ēdzì*. The reason given for this is that the latter are contractions of *owó-kay*, *owó-edzì*, i. e. one cowrie, two cowries, &c.

It thus appears that this peculiar arithmetic is of wide distribution, and by no means confined to a single or even to cognate races. A more perfect knowledge of barbarian languages would probably show its still greater extension. In what process of the human mind it has its origin, and the reasons for the singular collocation of objects which different tribes embrace in the several forms of the numerals, are questions of curious speculation.

The division of objects into animate and inanimate, or, as they have been termed by other writers, noble and ignoble, is a well-known feature in several of the languages of North America. Mr. Howse states that the Cree and Chippeway (Ojibwa) nouns are divisible into two classes, animate and inanimate, analogous to gender in European languages, but that many inanimate nouns, from possessing some real or imaginary excellence, are personified as animates. Perhaps a clue to this may be found in the pantheism, or rather pan-demonism of the Indian mythology. The Indians of Oregon, for example, believe that not only all animals were once people possessed of supernatural powers, or magicians, but that prominent mountains, isolated rocks, very old trees, and other remarkable objects, were so likewise, a belief which, in fact, seems to have characterized the superstitions of all the tribes of the continent. But, though this might account for a simple division into animate and inanimate, embracing all such objects, it would not explain the multiplicity of forms exhibited in some of the examples above given. The disposition to particularize, and the want of generic terms among barbarous races, may have had some connection with this division, for since to adopt a different system of counting every object would be impossible, the simple desire to be specific may have led to an anomalous form of classification.

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The second object in this investigation is to ascertain the series of numbers upon which enumeration is based among different tribes. The most natural, and, among barbarous nations, most common, is the quinary system, or that by fives, corresponding with the fingers of one hand. In this the first five digits are simple, that is to say, are all different; the second form compounds or modifications of these first, as will be seen by referring back to the example given of the Mexican. In many cases, however, it has happened that, in the lapse of time, new words have been adopted for a portion, while the old have become obsolete, or appear only occasionally in combination. In a number of vocabularies examined, it would appear that the numbers 7 and 8 most frequently retain the compound form, and 10 has oftenest changed. The 7 and 8 usually contain the elements of the words 2 and 3, as representing the 2d and 3d fingers on the second hand. Nine is frequently "one less than ten."

Probably in almost all these languages the quinary system was the oldest, and the decimal, where it now exists, has been of subsequent introduction, or rather growth. In the Chinook, for example, the names of the digits are all simple with the exception of that for seven. Thus *makst* two, *sini-makst* seven, *sini* being, perhaps, an obsolete form of five. These obsolete forms are sometimes revealed in the numeral ten and its compounds and multiples. Thus the simple digit ten may have one name, while in eleven=10+1, or twenty=2×10, the word will be entirely different. In the Napa, of California, *hopen* signifies two, and *ma-ha-ish* ten, but twenty is *hopi-hol*, the other multiples retaining the syllable *hol* up to one hundred, which is *ma-ha-ish sol*, the *h* being changed to *s* for euphony.

Twenty is, in some languages, a translation of *two tens*, in others a distinct word exists, and this is in many the name for head, body, or person, as in the Opata, *seis dosme* (literally one person), signifying, of course, all the fingers and toes of one person. In the Nisqually the word for twenty, s'ha-lat-chi, means literally the fingers and toes. As to the other multiples of ten, they are usually expressed by the literal translation of 3×10, 4×10, &c. But in the Opata and kindred dialects this form occurs, 20, *seis dosme;* 30, *seis dosme macoi tarewa*, i. e. ten more than one person; 40, *wodun dosme*, or two twenties; 50,

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wodun dosme macoi tarewa; 60, *beidum dosme,* three twenties, &c.

A good many anomalous forms occur, unnecessary to repeat here, as, for instance, 2×4 for 8, 2×3 for six.

Besides the quinary and decimal series, the binary and vigintesimal are supposed to be represented.

A sufficient number of extended vocabularies of numerals have not been obtained to admit of a thorough examination and comparison of the different series in use, and the following table has, therefore, been prepared, which will enable the collector to combine both subjects of inquiry in one, the figures having been selected in reference to the latter, and the arrangement in parallel columns to the former. These are headed "Simple Cardinals," "Personal Cardinals," and "Cardinals of Value," merely as a guide, and not as indicating that they will in all cases convey the true idea. It is desired that as careful inquiry as possible should be made into the facts in each one, and that the objects included in the separate classes be enumerated. It is probable that in some languages other columns must be added.

Very few tribes, it will be found, count beyond 100, while some of the more ignorant have no numbers beyond five. It is desirable in all cases, if possible, to ascertain the meaning of the larger collective numbers, as 10, 20, and 100, and another point of inquiry may be the names of the different fingers, especially of the thumb, thus:—

Little finger.
Ring finger.
Middle finger
Fore-finger.
Thumb.

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TABLE OF NUMERALS.

	Simple cardinals.	Personal cardinals.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
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16		
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19		
20		
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25		

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TABLE OF NUMERALS.

	Cardinals of value.	Other cardinals.
1		
2		
3		
4		
5		
6		
7		
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10		
11		
12		
13		
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TABLE OF NUMERALS.

	Simple cardinals.	Personal cardinals.
30		
40		
50		
60		
70		
80		
90		
100		

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TABLE OF NUMERALS.

	Cardinals of value.	Other cardinals.
30		
40		
50		
60		
70		
80		
90		
100		

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